EPA Region 1 RAC 2 Contract No. EP-S1-06-03

May 19, 2014
Nobis Project No. 80021

Via Electronic Submittal

U.S. Environmental Protection Agency, Region 1
Attention: Mr. James DiLorenzo, Task Order Project Officer
5 Post Office Square, Suite 100
Boston, Massachusetts 02109-3919

Subject: Comments on Olin's Draft Final OU1 and OU2 Remedial Investigation Report
Olin Chemical Superfund Site, Wilmington, Massachusetts
Remedial Investigation/Feasibility Study Oversight
Task Order No. 0021-RS-BD-01CH

Dear Mr. DiLorenzo:

Nobis Engineering, Inc. (Nobis) has prepared its comments, on behalf of EPA, to the Olin *Draft Final Remedial Investigation Report Operable Unit 1 (OU1) and Operable Unit 2 (OU2)" for the Olin Property, Wilmington, Massachusetts, dated April 10, 2014* (OU1/2 *RI),* prepared by AMEC Environmental and Infrastructure, Inc., on behalf of the Olin Corporation (Olin) for the Olin Chemical Superfund Site (Site) in Wilmington, Massachusetts.

Nobis has prepared a document containing the major comments on the OU1/2 RI. In addition, all comments have been compiled and are provided as attachments to this document.

Should you have any questions or comments, please contact me at (978) 703-6013, or hford@nobisengineering.com.

Sincerely,

NOBIS ENGINEERING, INC.

Heather M. Ford
Associate/Senior Project Manager

Attachment

c: File 80021/MA

SEMS Doc ID 644090

REVIEW OF
DRAFT FINAL REMEDIAL INVESTIGATION REPORT
FOR OPERABLE UNIT 1 AND OPERABLE UNIT 2
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

MAJOR COMMENTS

OVERALL DOCUMENT

1. There are a large number of inconsistencies with feature names and abbreviations, in particular when discussing the former OU1 or OU2 specific features; references that are incorrectly cited and/or not included in Section 9.0; typographic errors both in the prior material and in the updated material; and inconsistencies between text and table citations. In any instances, these errors have not been corrected from prior RI versions and the new text, added at the request of stakeholders, has contained many of these same errors. In some locations, the errors cause significant results to be omitted from the text, and in other locations may confuse the reader. These should be fixed as promised in Olin/AMEC's response dated 7/26/13.

2. Olin/AMEC committed to changing the report in the responses to many of the comments; however, many of these revisions were not made. These include, but are not limited to, the following comments: EPA comments 22, 114, 125, 149, 164, 167, 182, 184, 199, 222 through 226, 228, 229, and 239, and GeoInsight comment 2.

SITE FEATURES

1. As requested, the discussions of the CSL, Landfill Brook, and North Pond have been added to Section 4.0 of the RI as self-contained discussions, complete with discussions of hydrogeology and fate and transport. In addition, the discussion of these features in Section 4.0 should follow the same format as the sections, with tables showing analytical results and a summary of all exceedances of screening criteria. However, as the EPA guidance on RIs (Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, EPA, 1988) states, this information must be presented in the context of the Site setting; therefore, the discussion of geology and hydrogeology for these features should be moved to Section 3.0. Further, the discussion of contaminant fate and transport to and from these features should be moved to

Section 5.0. Additional areas including Pan Am Railway soils and Landfill Brook should also be included in the discussions as described above.

GROUNDWATER

1. Section 4.3.2.3 and Section 5.0 rely on groundwater data to discuss surface water trends and sources. However, the supporting groundwater data are not included in the report, as AMEC/Olin had stated in comment responses to the draft final RI (see former Comment 2). EPA agrees that the entire groundwater data package is not required for the OU1/OU2 RI. However, when nearby wells are referenced, the data in question must be included. In addition, Section 5.0 extensively references groundwater concentrations in the vicinity of specific features. These concentrations and the wells used to provide the data should be tabulated, preferably in Section 4.0, so they can support the Section 5.0 discussion.

2. Olin/AMEC appears to consider groundwater transport to be the primary cause of contamination to surface water and sediment, as this is the only transport method presented in the CSM (Section 5.4). However, other potential transport mechanisms include leaching and overland flow and these must be discussed in Section 5.0 Examples:

    - Note although Olin/AMEC suggest that leaching is only a potential issue for TMPs (which EPA disagrees with; see comments on leaching/Appendix J), this mechanism should still be described in Section 5.0].

    - Likewise, several contaminants, such as PAHs in the vicinity of the former boiler area, exceed industrial RSLs in surface soil and may be transported via overland flow (runoff). The potential for overland flow should be evaluated in terms of the available ground cover and the drainage area for the surface water bodies potentially impacted by surface contamination.

3. All groundwater, including DAPL, will be considered as potential drinking water for purposes of evaluation under OU3.

CONTAMINANTS

1. In Section 4.0, Olin/AMEC contend that the hydrazine, formaldehyde, and acetaldehyde detections in surface water and sediment are from “non-Olin sources.” Note that hydrazine

exceeded the industrial RSL in on-property soil, with detections associated with industrial and disposal areas. This suggests that the hydrazine is associated with the plant operations. Olin/AMEC has refused to provide figures for these three compounds to assess their distribution in surface water and sediment. Kempore was also detected in the MMBW. Although the risk from these low detections may be low in off-property surface water and sediment, their presence infers a transport pathway to the MMBW and other areas where they were detected. Therefore, Section 5.0 should include this potential pathway and acknowledge that the relatively low number of samples collected for specialty compounds present a data gap for future work at the Site. This data gap is not significant enough to require additional sampling to hold up the RI process, but may be important in Site cleanup decisions.

2. Section 4.2.6.5.4 (page 4-44): Acetaldehyde was not detected in background sediment samples or in Landfill Brook or the West Ditch. Therefore, it does not appear to be ubiquitous in the area and cannot be ruled out as a non-Site related source as suggested in this section.

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manganese AWQC. Please show the arsenic and manganese surface water results on separate, new figure so that the distributions of these contaminants can be viewed.

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GEOLOGY

1. Section 3.2.1: The Site is considered OU1 and OU2; therefore, discussions of surface and subsurface must be expanded. Specifically (but not inclusively), description of peats and other materials in the MMBW: Requested depictions of borings and additional descriptions in locations that were not covered by the 400-series borings (former Comment 115). Detections of Kempore and hydrazine suggest that concentrations of Olin-related contaminants are reaching the MMBW. Therefore, the discussion of the geology should be extended to that of the MMBW in addition to the Olin property itself. Although Olin/AMEC did include cross-sections of the MMBW, these cross-sections (or the MMBW) are not referred to in the text in Section 3.2.

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1. Olin/AMEC agreed to present discussions of the soils which have been returned to the containment area from a nature and extent standpoint but this was not presented in Section 4.0 (see former Comment 20e). The available samples for this material and the analytical results should be addressed in Section 4.0, preferably in a subsection of Section 4.1.

SURFACE WATER/SEDIMENT

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CONCEPTUAL SITE MODEL/FATE AND TRANSPORT

1. Olin/AMEC contend that contamination in several off-property locations may be from sources other than the Olin property (Section 5.1). However, these locations are not described in any systematic way. These other potential sources should be added in Sections 3.0, 4.0, 5.0 and 6.0, preferably in their own subsection(s), and described in terms of their potential contaminant load, relationship to OU1/OU2 features, and potential fate and transport pathways. Any discussion of off-site sources should have citations to a reference in Section 9.0.

2. Figure 5.0-1: The CSM depicts groundwater transport to surface water, but no other potential sources and transport pathways for soil, surface water, and sediment. The other pathways include surface water flow, sediment migration, overland flow/runoff, and percolation/leaching of contaminants. AMEC/Olin may elect to provide a second, plan-view figure for ease of display for some of these transport pathways.

HUMAN HEALTH RISK ASSESSMENT

1. *The text in Section 6.5 states: "Risks at or below 10^{-4} do not generally warrant a response action. Risks greater than 10^{-4} generally warrant development and evaluation of remedial alternatives." EPA cleanup actions can be triggered with risks at 10-6; however, cleanup decisions are based*

on a review of total risks at a site. Please remove this statement or modify it to reflect that a broader EPA policy risk management decision may be determined.

2. *Because of the limited dataset used (incomplete analyte sampling and unknown depths of samples), the prior submittal to EPA was not adequate to establish that there are no future risks from exposures to subsurface soils in this area in the absence of a permanent cap. Therefore, if an evaluation of future exposures to subsurface soils at the containment area is to be included, it must be based on a more comprehensive dataset than what is currently available. As stated in Section 1.0, "The objective of the HHRA is to characterize health risks to human populations that are assumed to be potentially exposed to chemicals of interest (COIs) associated with historical operations at the Property under the current and foreseeable future uses of the Site,* ***in the absence of any additional remedial measures****." The permanent cap is an additional remedial measure that has not been installed; a final decision on the need for an evaluation of the cap soils is pending with EPA. Calculations of future exposures to subsurface soils at the containment area have been referenced in the text, but have not been provided in the HHRA. Please provide this evaluation in the HHRA or eliminate reference to them.*

3. Olin defines "Contaminants of Interest" or COIs as "chemicals that have been associated with the former facility (as a raw material, product, or a constituent of waste streams or accidental releases) and that have been released to one or more environmental media." Please modify this definition to include all substances that are/were raw materials, reactants, intermediates, products, by-products, or waste products associated with onsite process or manufacturing operations, releases, discharges, or emissions, and any substance that resulted from the degradation or transformation by biotic or abiotic processes of released substances. Note that anything detected in DAPL is also a COI as are PAHs, EPH/VPH, etc. Please provide a table listing the COIs.

4. Data results presented in Attachment 2 are inconsistent with RI Appendix E data validation reports and COPC selection tables. It appears the error lies within Attachment 2. Since Attachment 2 is the only presentation of all the data used in the HHRA, the apparent error makes it impossible to verify EPCs and calls into question the risk calculations.

5. The chromium evaluation presented in Attachment 7 of Appendix M is critical to the understanding of chromium speciation in site media. However, concerns with the data included are noted.

    a. There are samples presented in Table 1 of Attachment 7 that are not presented in Attachment 2.
    b. Concentrations presented in Attachment 7 do not match consistently with concentrations for the same sample in Attachment 2.
    c. Sediment data from Table 2-30 (North Pond) has not been incorporated into the chromium and hexavalent chromium comparison for sediment.

6. There are concerns regarding exposure point concentrations (EPCs), methodology, equations, exposure assumptions, and or toxicity factors. Because the data displayed in Attachment 2 in Appendix M (Interim Deliverable #3) does not agree with Appendix E of the RI (contains all data from 2009 to 2013), EPCs could not be confirmed. Olin/AMEC needs to confirm the validity of the data in Attachment 2 and rerun the EPC calculations, if needed.

    - Revising the SA to be consistent with the methodology presented in Tables 3.3-6 and 3.3-7, as well revising the body parts to include head, forearms, hands, lower legs, and feet for both the adult and adolescent trespasser.

    - Inclusion of the dermal ABS values presented in the EPA RSL table (November 2013).

    - Inclusion of NJDEP CSF for hexavalent chromium.

    - Inclusion of revised UCL for Aroclor 1260 for small area of PCB results.

    - Inclusion of VF from RSL table rather than the PEF for VOCs in soil.

    - Inclusion of DA_{event} in surface water dermal pathway.

    - Inclusion of EPA revised vanadium RfDs.

- Inclusion of maximum in place of UCL in instances with small dataset.

In addition, the mutagenic mode of action approach for additional contaminants, and TCE and vinyl chloride specific equations were considered. Resulting risk estimates increased for some scenarios; however, the increases were not great enough to change the conclusions of the risk assessments.

7. Clarification and/or changes in assumptions or methods are needed as follows:

   a. Please provide an explanation of how exposure point concentrations were determined for small data sets and how non-detects were handled. Please provide the ProUCL inputs in excel spreadsheets showing sample IDs and chemical concentrations to allow EPA confirmation of EPCs.

   b. Please calculate inhalation risks from volatiles in shallow soil by using a volatilization factor rather than a PEF to determine air concentrations.

   c. In addition to the list of COPCs with an identified mutagenic mode of action provided, contaminants that act via a mutagenic mode of action also include benzo(k)fluoranthene, chrysene, hexavalent chromium, NDMA, TCE, and vinyl chloride. It appears cancer risks for benzo(k)fluoranthene and chrysene were evaluated accounting for the mutagenic mode of action. However, adolescent trespasser cancer risks for hexavalent chromium, NDMA, TCE, and vinyl chloride need to be revised to account for their mutagenic mode of action.

   d. TCE was selected as a COPC in surface water. Unique equations are used for the evaluation of childhood exposures to TCE. Please add a sub-section to discuss the equations used to evaluate trespasser risks to TCE in surface water. Cancer risks will also need to be updated to account for this evaluation.

   e. Risk calculations for hexavalent chromium using the Tier 3 oral CSF from the New Jersey Department of Environmental Protection (NJDEP) are discussed in the uncertainty section. However, the calculations were not provided. In addition to providing calculations, please expand this discussion to include trespasser cancer risks to hexavalent chromium using the NJDEP CSF, as well as apply an ADAF for mutagenic mode of action.

f. Please revise the surface area calculations presented in Tables 3.3-6 and 3.3-7 to include the head, forearms, hands, lower legs, and feet for both the adult and adolescent trespasser and correct trespasser skin surface areas on Tables 3.3-1 and 3.3-2 (and those used in the risk calculations) to match these re-calculated surface areas.

g. Please correct the formula for dermal contact with surface water presented in Table 3.3-4. The dermal exposure to surface water pathway should include the DA_{event} parameter, as presented in Appendix A of EPA's RAGS Part E guidance document. It is unclear what the PC_{event} term is used for and where the referenced PC_{event} table is presented.

h. Please present chemical-specific dermal ABS factors used in the calculation of dermal exposures.

i. Please use the vanadium and compounds RfD presented in EPA Regional screening Level Tables (5.0E-3 mg/kg/day) and revise the HHRA Table 4.2-1 and Attachment 11 tables to be consistent in the use of RfDs for vanadium.

8. The uncertainty section lacks discussion of several important contributors to uncertainty:

a. Please include discussion of potential COIs without available analytical methods, such as Nitropore OT and Nitropore 5T, which were therefore not analyzed for and not evaluated in the RI or HHRA.

b. Please include discussion of potential impacts of evaluating the small area of PCB contamination as part of the larger EA1 area, with potential underestimation of EPCs and risks resulting from including numerous non-detects from the larger area in the 95%UCL calculation.

c. Please provide a complete list of COPCs without published toxicity values, for example, 4-isopropyltoluene, carbazole, dimethylphthalate, delta-BHC, and Kempore should be included in the uncertainty discussion.

d. The uncertainty discussion does not include but should discussion of the EA1 subdivision memos (attachment 13) and support for keeping former manufacturing and former waste disposal areas of EA1 as a single large exposures area.

ECOLOGICAL RISK ASSESSMENT COMMENTS

1. The comparison site concentrations to medium-specific benchmarks in the BERA should be done on a sample-by-sample basis (Note: while helpful, this approach is not necessary for COPEC). The use of RME and CTE EPCs for benchmark comparison in the BERA may be useful for discussion purposes, but the only way to identify potential hot-spots and provide risk managers with sufficient information to make decisions is to provide sample-by-sample comparisons. This approach is even more essential when few lines-of-evidence are available for a specific assessment endpoint.

2. Acute AWQC and chronic AWQC should be presented together in the risk characterization. Because AWQC are promulgated standards, the exceedance of chronic AWQCs is instrumental in the risk management process.

3. Food chain modeling BAFs have major issues. There is insufficient information regarding the hierarchy of sources used to develop each type, insufficient information provided within the document to reproduce calculations (i.e., equations not provided and many input values not provided), inconsistencies in values among tables, and given the available information, it appears as though the values from regression modeling that result in tissue concentrations are erroneously used as uptake factors that are applied to abiotic media concentrations to calculate tissue concentrations. These problems have a ripple effect through all of the food chain modeling, affecting the HQ in various directions/magnitude depending upon the tissue type and COPEC.

4. For chromium animal BAFs, a different approach was used from what as in the July 2013 draft. Essentially, Olin asserts that there is no appropriate soil invertebrate BAF for chromium and, using the regression model they say is invalid, select not a BAF, but a tissue concentration of 4 mg/kg to be used as the EPC for chromium and hexavalent chromium at all sites for all animal tissues. This approach is not acceptable and potentially substantially underestimates chromium risks.

5. Although an approach to deriving TRVs was presented, the execution does not always seem to follow the approach. For example, the approach states that Eco-SSL values would be used first. COPECs such as PAHs, and DDT and metabolites, and arsenic have Eco-SSLs, but the TRVs therein were not used. Another example is that for lead in birds, a MATC of 1.63 mg/kg-day was reported and the table shows no uncertainty factors to be applied, yet the NOAEL TRV is 4.7 mg/kg-day and the LOAEL TRV is 8.3 mg/kg-day. These problems affect the HQ in various directions/magnitude depending upon the animal class and COPEC.

6. Dose calculations using Olin's inputs are not reproducible for a large number of the ones that were checked (i.e., 19 out of the 36 "Total Dose" values). All 19 values that EPA calculated are higher than what Olin calculated. Six of these were different enough to result in risks greater than 1 for at least the NOAEL-based HQ that was lower than 1 based on Olin's calculations. For example, Table – EA-5 – RME – Red-Tailed Hawk – 2 shows bis(2-ethylhexyl)phthalate NOAEL-based and LOAEL-based Total HQs of 0.64 and 0.064, respectively. Using the values presented on Olin's tables, bis(2-ethylhexyl)phthalate NOAEL-based and LOAEL-based Total HQs of 1,690 and 169 were calculated. Please show the calculations as to how the Olin HQs were reached.

ATTACHMENT A

ATTACHMENT B

ATTACHMENT C

ATTACHMENT 4

REVIEW OF
DRAFT FINAL REMEDIAL INVESTIGATION REPORT
FOR OPERABLE UNIT 1 AND OPERABLE UNIT 2
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Nobis Engineering, Inc., on behalf of the U.S. Environmental Protection Agency (EPA), has reviewed and generated the following observations on the "*Draft Final Remedial Investigation, Operable Unit 1 and Operable Unit 2",* prepared by AMEC Environmental and Infrastructure, Inc., on behalf of the Olin Corporation (Olin) for the Olin Chemical Superfund Site (Site) in Wilmington, Massachusetts. As requested by EPA, the "*Draft Final Remedial Investigation, Operable Unit 1 and Operable Unit 2*" was submitted on April 10, 2014. Comments below provide review of this Draft Final RI.

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1. Olin/AMEC contend that contamination in several off-property locations may be from sources other than the Olin property (Section 5.1). However, these locations are not described in any systematic way. These other potential sources should be added in Sections 3.0, 4.0, 5.0 and

6.0, preferably in their own subsection(s), and described in terms of their potential contaminant load, relationship to OU1/OU2 features, and potential fate and transport pathways. Any discussion of off-site sources should have citations to a reference in Section 9.0.

2. Figure 5.0-1: The CSM depicts groundwater transport to surface water, but no other potential sources and transport pathways for soil, surface water, and sediment. The other pathways include surface water flow, sediment migration, overland flow/runoff, and percolation/leaching of contaminants. AMEC/Olin may elect to provide a second, plan-view figure for ease of display for some of these transport pathways.

SPECIFIC COMMENTS

SECTION 2.0 COMMENTS:

Section 2.1 Page 2-8. Please clarify that RSD-09 and RSD-10 have been added to the soil data sets and confirm that this has occurred in tables and soil discussions.

Section 2.1. Please include the definition of a hotspot per the MCP as indicated in Olin's March 21, 2014 response to EPA comment No. 109.

SECTION 3.0 COMMENTS:

Comment 6: Section 3.2.1: Description of peats and other materials in the MMBW: Comment 115 requested depictions of borings and additional descriptions in locations that were not covered by the 400-series borings. Detections of kempore and hydrazine suggest that concentrations of Olin-related contaminants are reaching the MMBW. Therefore, the discussion of the geology should be extended to that of the MMBW in addition to the Olin property itself. Although Olin/AMEC did include cross-sections of the MMBW, these cross-sections (or the MMBW) are not referred to in the text.

Recommend changing Section 3.3 to be Hydrogeology, add a section 3.3.1 header for overburden hydrogeology, and making the other sections 3.3.2 (bedrock) and 3.3.3 (surface water).

Page 3-10 to 3-12: (brought forward old comment): from previous Olin/AMEC comments, it is not clear if the off-property west ditch has water only immediately after rain events or generally has water year-round. Please add qualitative flow details to this section. Likewise, the fact that the on-PWD is ephemeral should be added.

Page 3-14, first paragraph: I didn't think that the camera survey was conclusive regarding the hydraulic connection between North Pond and the site.

Comment 115: this comment was regarding the integration of new and old soil borings to determine site geology. A few older borings were added to the cross-sections to flesh out the discussion – is this sufficient? None of the borings from the MMBW have been added, either.

Comment 125: language in the comment regarding the size of the Central Pond's drainage area has not been added to the text. Please add.

SECTION 4.0 COMMENTS:

Comment 7: As discussed in the original Comment 20e, Olin/AMEC has agreed to a discussion of the soils which have been returned to the containment area from a nature and extent standpoint. This discussion was not included in Section 4 of the Draft Final RI. The available samples for this material and the analytical results should be addressed in Section 4, preferably in a subsection of Section 4.1.

Comment 8: The complete sediment and surface water data are not provided in the report. The tables in Section 4 (Tables 4.1-4 through 4.1-10 and 4.2-3 through 4.2-10) provide only detected results. In order for the RI to be complete, the complete summary data (including detection limits of non-detect results) should be provided, either in an appendix similar to Appendix F or included in Appendix F.

Comment 9: The sediment results are compared to the available background sediment data, which are from only 2 samples. Several locations do not have applicable sediment results. Given that AMEC/Olin refuse to use other sediment screening criteria such as RBCs or values from NOA screening quick reference tables for sediment, the sediment results should be compared to

the industrial RSL for soil. The text should discuss exceedances of these criteria as was done for soil.

Comment 10: Section 4.1.3.1.2: Hexavalent chromium is discussed relative to chromium in soil. However, the evaluation of chromium speciation refers to Attachment 7 of the HHRA Second Interim Deliverable. As a future reader is not expected to have ready access to the HHRA Second Interim deliverable, this documentation should be included in the RI itself.

Comment 11: Section 4.2.6.5.4 (page 4-44): Acetaldehyde was not detected in background sediment samples or in Landfill Brook or the West Ditch. Therefore, it does not appear to be ubiquitous in the area and cannot be ruled out as a non-Site related source as suggested in this section.

Appreciate reorganization/breakout of discussion into subsections. Section much better organized and more detailed.

The Section 4 summary tables only indicate detected compounds, and the report still does not have an equivalent of Appendix F for surface water sediment/samples showing all analytical results. It is therefore difficult to determine if the lack of sample results in certain circumstances is the result of non-detects or if contaminant groups were not analyzed. The full analytical results should be readily available somewhere in the report, and EPA strongly recommends they be added either to Appendix F or as a separate appendix (this is really for AMEC/Olin's benefit in addition to making the report clearer).

Sediment – do we truly have nothing to compare the sediment data to for Section 4? Can we push to have at least 1 eco benchmark or 1 direct contact benchmark, given the fact that trespassers/others may contact the sediment? I would be ok with the industrial soil RSL.

Section 4 continues to have a number of minor typographic mistakes, some of which may confuse the reader. For example, the omission of commas in lists such as in Section 4.1.6.3.3 suggests that one of the compounds in question is "phenol acetophenone".

4-37, Section 4.2.5.6: Strongly recommend fully incorporating North Pond into the report as another OU2 water body (in Section 3, section 4, tables, etc.). However, this would require a lot of effort from AMEC/Olin and I anticipate a strong backlash.

Referenced reports should be included in the reference list. These include the Ritter Trucking FSIPR (4-37, Section 4.2.5.6); the E.C. Whitney final SIPR (4-40, 2nd paragraph); the CSL closure certification (4-45, Section 4.3.1); the 2008 Geomega report and ATSDR report on the WSL (4-46, Section 4.3.2).

4-47, Section 4.3.2.1: This section should be added to the appropriate location in Section 3.

I would argue that the entire CSL evaluation, Landfill Brook headwater evaluation, and North Pond evaluation should be presented in Section 5, with only the applicable chemistry data retained in Section 4 and the physical descriptions moved to Section 3.

Sections 4.1.2, 4.1.3, 4.2.2, and 4.2.3 have not been broken into discussions of separate areas, as requested in comment 6. Olin has indicated it is unwilling to separate out the soil discussion.

4-3, third paragraph, last sentence: I'm not sure we agree with this "USEPA agreed with Olin that a point-by-point review and discussion of analyte concentrations exceeding SSLs was not warranted." Check with MB.

4.1.3.1.1 (page 4-8): The text refers to Figure 4.1-29 as the arsenic box plot for the site, but this actually refers to Figure 4.1-30 (the figures are switched).

4-9 and 4-10 (last paragraph/1st paragraph): Ok to refer to Attachment 7 of the HHRA second interim deliverable? This seems like it could be hard to find in the future. Would prefer it somewhere in this document.

4-10, 2nd paragraph: this paragraph was added because of on-going discussions, but I don't think it's needed for the N&E discussions. Recommend omitting.

4-17, 4th paragraph: should discussion of exposure areas be included here? I'm thinking not…

4-20 and 4-21, Section 4.1.5.2.1: the only section heading is for metals and inorganics. Recommend adding another section for organics (or specialty compounds), as this section discusses specialty compounds.

4-24, Section 4.1.6.3: The text should address the lack of specialty compound analysis. Recommend using the discussion noted in the response to original comment 154.

4-25, Section 4.1.6.4.3: The text notes that constituents identified in sediment are also present in groundwater. Presumably the groundwater in question is from nearby monitoring wells, in which case the wells should be identified in the text.

4-41, Section 4.2.6.4: Were specialty compounds analyzed for at this location? If not, the section should include a justification for not sampling here. If so, the lack of detections should be indicated. (*this is why I was pushing for a separate table with all analytical results – it's almost impossible to figure out what was and wasn't analyzed if it wasn't detected*).

4-44, 3rd paragraph: The text appears to state that a data gap does not exist because historical data at the time did not indicate the potential for impacts. Recommend rewording the paragraph so that it is clear the data gap is addressed by the groundwater results, not the historical data, which is not included in this report.

4-44, Section 4.2.6.5.4: Acetaldehyde has not been detected throughout the Site, nor has it been detected in background samples, nor in other off-property sediment samples. Therefore, it does not appear to be ubiquitous in the area and cannot be ruled out as a non-Site related source.

4-49, Section 4.3.2.3: The discussion in this section references analytical results from monitoring wells within the CSL and WSL. These should be tabulated (with complete results) to allow for comparison for the discussion.

Sections 4.1.2 and 4.1.3. The nature and extent discussion of soils (and tables 4.1-1 through 4.1-3) handles all soil by depth interval. The discussion is improved, but still does not divide soil by area either in the discussion or in tables. As agreed to previously, Figures 4.1.1a and 4.1.1b should distinguish soils used in the HHRA from soils excluded from the HHRA.

Sections 4.1.4.1. Page 4-15. Section 4.1.4.1 states perimeter concentrations are below RSLs or "published" background. Please also discuss comparison to site specific background.

Section 4.0. The RI does not provide a discussion of the EPH/VPH area data that have been excluded from the HHRA because they were collected prior to the AS/SVE system operation. Please present these data separately in the RI Section 4.0.

Section 4.0. Please include a discussion of important markers regardless of toxicity in the RI nature and extent discussions. EPA also notes that some non-toxic chemicals, sodium for example, may serve as markers for Olin contamination.

Section 4.0. Please provide a discussion of the containment area subsurface soils.

Section 4.0. Please provide a discussion of the Pan Am railway soils separately and show location of samples on a figure.

Section 4.1.6. The nature and extent discussion of sediment uses comparison to two background samples only. Comparison to a benchmark is needed. Industrial soil RSLs or eco-based benchmarks (used in the ERA) should be used to provide the reader with some understanding of what levels are elevated.

Surface water figures on other analytes with a comparison to AWQS (Manganese and Arsenic) and others even without AWQC (BEHP, copper, PAHs) are still needed.

SECTION 5.0 COMMENTS:

Generally the CSM as presented in the RI is weak, unsupported and incongruent with other data stated and presented in the RI as well as previous statements and data presented by Olin. The level of detail as discussed and agreed upon by Olin and EPA is not provided.

Generally Section 5.0 is unorganized skipping from one topic to another without apparent connection or applicable change in heading or subsection. For example Section 5.2 on page 5-7, the first paragraph on this page finishes the discussion of TMPs from the prior page, the next paragraph is a reiteration of the general overview of the CSM. The next paragraph is a discussion

of the CSM in the south ditch area followed by a discussion of groundwater flow paths relevant to surface water and ultimately the groundwater divide. Material and concepts in this section are generally disorganized and not useful to understand the overall conceptual model of the Site. Another example is the paragraph at the top of page 15-14 where the LNAPL smear zone associated with Plant B and the TMP area near the administrative building are both discussed in the same paragraph and stated to be associated without conclusion as to why this was being presented. A more coherent and logical presentation of the items discussed is required.

Figure 5.0-1, Referenced in Section 5.0. This figure appears to show movement of contaminants from DAPL pools in bedrock lows to diffuse GW. This diffuse GW is transported horizontally and also vertically upward to surface water. This CSM figure shows that impact to surface water from contaminants emanating from DAPL pools is occurring even in areas where shallow and adjacent GW is not impacted (408s and 202s). This seems inconsistent with Olin's assertion that shallow groundwater in the MMB isn't impacted. Please clarify.

Figure 5.0-1; This figure does not show how unsaturated soils at the site were impacted outside of the discharge area (Lake Poly). Soil contamination is not shown. Additionally this figure does not address sediments or transport after contaminants enter surface water.

Section 5.2, referring to the on property ditch system, states that "*The majority of impacts on-Property have been remediated, reducing the potential for continued migration of Contaminated sediment. There is no longer a direct migration pathway from former source areas (disposal features) to surface water or sediment".* If this is true how does Olin explain the apparent recontamination of south ditch sediments as well as sediment contamination in Central Pond.

Section 5.2- *"An area of limited LNAPL volume is present behind Plant B, which is contained by the Plant B groundwater recovery/treatment system. As leaching from this LNAPL within the zone of groundwater fluctuation occurs at and below the water table, any migration pathway associated with LNAPL is considered part of OU3."* Agreed that the Plant B area is largely a OU3 issue, however a discussion beyond what is presented here must be included as one of the premises of the Plat B system was to depress the groundwater table to expose impacted soils in the smear zone for treatment (i.e. now unsaturated).

Section 5.4 lists “potential” transport mechanisms in environmental media- at this point in the RI process the transport mechanisms should be known and should be presented as specific examples by site area.

Please describe the use of Lake Poly and its overflow as an artifact of the current configuration of DAPL and diffuse groundwater locations. Include a discussion of the East and West Pits in receiving wastes, as well as the transition to east, west and central acid pits between the newer warehouses and the south ditch and how they relate to the current configuration of DAPL and diffuse groundwater locations.

On page 5-6, it states that liquid disposal practices resulted in direct discharge to the ditch system. The ditch system continues to contain elevated Site related constituents. Olin states there is no longer a direct migration pathway from former source areas to surface water and sediment. Although Plant B and the Lake Poly areas may not be significant sources to surface water or sediment, other areas continue to be significant sources. For instance on page 5-7, it states that “liquid wastes” were disposed in unlined pits and dense liquids migrated vertically downward to the bedrock surface, where DAPL flowed and pooled in bedrock depressions. The DAPL pools are immediately overlain by impacted overburden groundwater that also threatens the quality of surface water. This is demonstrated by elevated ammonia and NDMA on the east side of the property in the South Ditch.

Because of the widespread nature of the liquid wastes disposed, these are identified as Principal Threat Wastes. The NCP promulgated on March 8, 1990 states that EPA expects to use treatment to address the principal threats posed by a site whenever practicable and engineering controls, such as containment for wastes that poses a relatively low long term threat. Principal threat wastes are source materials considered to be highly toxic or highly mobile that cannot be reliably contained or would present a significant risk to human health of the environment should exposure occur.

On page 5-7, please provide the basis (sampling results) for the statement that soil impacts did not extend beneath the unoccupied office building.

Also on page 5-7, the route of migration to OU1 and OU2 surface water is groundwater discharge. What percentage of chemicals found in South Ditch originate from inside the slurry wall where pools of liquid chemical (Principal Wastes) reside and migrate under or through the wall.

Also on this page, seasonal effects of groundwater elevations suggests that October has higher elevations than May. This is contrary to what generally occurs in Eastern Massachusetts. The water table is at its lowest in the Fall when evapotranspiration rates begin to decline.

On page 5-9, what is the basis for the statement that formaldehyde is ubiquitous? Where else was it detected? On page 5-9 you state that acetaldehyde is associated with plant growth cycles yet EPA's website describes the predominant use of acetaldehyde is as an intermediate in the synthesis of other chemicals and is used in the production of perfumes, polyester resins, basic dyes, as a fruit and fish preservative, as a flavoring agent, and as a denaturant for alcohol, in fuel compositions, for hardening gelatin, and as a solvent in the rubber, tanning, and paper industries. Please include these other uses and cite or eliminate the references to plant growth cycles.

On the same page, please eliminate the statement that acetone, 2 butanone and methylene chloride are laboratory contaminants based on all the data collected. On page 5-13, you acknowledge the most common organic chemicals detected include acetone and 2-butanone, TMP, NDMA and NDPA.

There is also discussion of DAPL, diffuse layers, diffuse groundwater, Diffuse Materials and Diffuse layer material. Please combine grounds with the same meaning and provide a table with concentration range for the primary constituents in each layer as well as their pH and specific conductance.

On 5-14, there is a statement that the DAPL material remains isolated in DAPL pools in bedrock depression and the mechanism for release from these pools is chemical diffusion. Please remove the statement that follows that this is a slow and inefficient mass transfer process unless a reference can be provided.

The text on pg 5-16 it states that ammonia is not stable in most environments yet we find ammonia in MMB and the South Ditch. EPA does not accept that ammonia present in these areas is not from the Site when it is a primary constituent of a DAPL layer. Olin will need to provide additional

groundwater data at multiple levels that the primary pathway is not from the DAPL areas into deep ground water prior to discharge to MMB or South Ditch.

Comment 12: Section 5.1: Olin/AMEC contend that contamination in several off-property locations may be from sources other than the Olin property. These locations are not described in any systematic way. These other potential sources should be added, preferably in their own subsection(s), and described in terms of their potential contaminant load, relationship to OU1/OU2 features, and potential fate and transport pathways. Any discussion of off-site sources should have citations to a reference in Section 9.

Comment 13: Section 5.1: PCBs (specifically Aroclor-1260) have exceeded their industrial RSL in OU1 soils and should be mentioned in this section. If Olin/AMEC consider PCBs to not be a potential source of contamination, the rationale for this should be included in the section.

Comment 14: Section 5.4: Olin/AMEC appears to consider groundwater transport to be the primary cause of contamination to surface water and sediment, as this is the only transport method shown in the CSM. However, other potential transport mechanisms include leaching and overland flow. Although Olin/AMEC suggest that leaching is only a potential issue for TMPs (which EPA disagrees with; see comment on Appendix J), this mechanism should still be described in Section 5. Likewise, several contaminants, such as PAHs in the vicinity of the former boiler area, exceed industrial RSLs in surface soil and may be transported via overland flow (runoff). The potential for overland flow should be evaluated in terms of the available ground cover and the drainage area for the surface water bodies potentially impacted by surface contamination.

Comment 15: Page 5-13, 1st paragraph: Given the relatively high hexavalent chromium concentrations in certain locations, it is not clear that the groundwater conditions (which may encourage trivalent chromium formation) are applicable to the soil, sediment, and surface water which are the focus of the OU1/OU2 RI. Additional discussion of chromium speciation is needed, preferably under the “Metals and Inorganics” section (page 5-15).

Referenced reports should be included in the reference list. These include the Gerecke and Sedlak (5-4, 1st paragraph); the Olin 2004 NDMA study (5-4, 2nd paragraph).

Section 5-1: Additions to the contaminant sources section have increased its overall length to 5 pages. Recommend adding subsections such as for SVOCs and metals to increase readability and to allow reviewers to find specific discussions more readily.

Section 5-1: Recommend adding a specific discussion of other off-site sources that may have impacted the study area and explaining the transport mechanisms (groundwater/surface flow) that may have caused the impacts seen downgradient/downstream.

Section 5-1: PCBs (specifically Aroclor -1260) have exceeded the industrial RSL in OU1 soils and should be specifically mentioned in this section.

(has Olin showed a map of hydrazine/formaldehyde detections in SW? If the concentrations are truly diffuse and not indicative of a point source, then that information should be added to the text).

Section 5.4: (this section is still a jumble, although it's at least partially organized by media group. Recommend header for transport mechanisms, then discussion of fate and transport by media, then by analyte group [or vice versa]. Most of the text concerns transport in water, but overland flow and leaching also need to be addressed).

Page 5-1, contaminant sources: On pages 4-8 and 4-11 to 4-12, Olin/AMEC notes that metals above background and PAHS above industrial RSLs are associated with former boiler house activities (Plant C Boiler and the former Laboratory Building Boiler) in surface soil. The former boiler activities should be added as sources of surface soil contamination.

Page 5-2, last sentence: This may be too late to bring up, but if the Ephemeral Drainage is not considered a water body, should there have been sediment/soil samples collected there? Presumably this could have been impacted from overland flow or from contamination within the South Ditch. The only boring nearby was SS-450, which was considered a background surface soil sample.

Page 5-3, 3rd paragraph: PAHs associated with railroad ties may not be related to Olin activities, but the elevated PAHS (above industrial RSLs) are located on the main body of the property and

apparently associated with boiler activities. Therefore, PAHs cannot be dismissed as potential contaminants in those areas.

Page 5-3, last paragraph, first sentence: NDMA should not be redefined.

Page 5-8, Section 5.2.1: Hydrazine and Kempore were both detected in the MMBW. The Kempore was detected in MMB-SW/SD-2 and the hydrazine was detected in MMB-SW/SD-8. These data suggest that groundwater from the Site is migrating to the MMBW, and that the groundwater discharge may not be in one isolated location. (I don't think this poses any risk, but it does call into question Olin's hand-waving about specialty compounds detected).

Page 5-13, 1st paragraph: Olin has previously provided a discussion of hexavalent chromium and its relationship to trivalent chromium in soils. This information should be added to the discussion of chromium in this section.

Page 5-16, third bullet: The discussion of NDMA should be moved to the section on SVOC transport on page 5-17.

COI definition – Please expand per HHRA comments to include potential breakdown products and provide table.

Include potential on-site sources of PAHs – paved area run-offs.

Please discuss Kempore and hydrazine detections in MMBW.

Please discuss Landfill Brook and North Pond.

Section 5.2 Please discuss the soil Vapor Intrusion evaluation and potential groundwater VI.

SECTION 8.1.1.2

Are the solutes found in the South Ditch and the groundwater beneath, leaking from the Slurry wall area or are they a result of historical east, west and central acid pits that were present here?

What were the hydrologic conditions present when the surface water samples were collected. It appears they were higher than normal low flow which would clearly dampen the results and provide non detects. Please compare to USGS gaging station record flow duration curves.

FIGURES

Comment 16: Figures 3.3-2 and 3.3-3: Several edits from previous comment 230 have been incorporated. However, two edits have not been made: 1. EPA would prefer to see a zoomed-in version of the figure, such as 1":500' scale. 2. The groundwater has been moved slightly south, but is still depicted as being 200 feet north of a groundwater high (shown by the 84' contour). EPA understands that the groundwater flow in this area is complex because of ongoing pumping, but the current figure implies that groundwater is moving uphill west of Plant B. This is not critical for the OU1/OU2 RI, but will be expected for the OU3 RI.

Comment 17: Figure 5.0-1: The CSM depicts groundwater transport to surface water, but no other potential sources and transport pathways for soil, surface water, and sediment. The other pathways include surface water flow, sediment migration, overland flow/runoff, and percolation/leaching of contaminants. AMEC/Olin may elect to provide a second, plan-view figure for ease of display for some of these transport pathways.

Comment 18: Olin/AMEC's response to previous comment 237 asserted that arsenic in surface water did not exceed its AWQC and that manganese does not have an AWQC. These are incorrect. Arsenic was detected in the off-PWD, Landfill Brook, East Ditch, and MMB; and exceeded the AWQC in all samples. All of the samples in the off-PWD, East Ditch, and Landfill Brook exceeded the manganese AWQC. Please show the arsenic and manganese surface water results on separate, new figure so that the distributions of these contaminants can be viewed.

Figure 2.2-1: The figure does not include the 2013 soil borings installed for PCB delineation. Please add these borings.

Figure 2.2-4: Olin's response to comment 228 committed to a separate figure for historical sediment data used in this report. Please include this figure as described in the response.

Figure 2.5-1: This figure shows location SDBK-002 as a background location. This should be omitted from the figure per Olin's response to original comment 167.

Figure 3.2-10: Olin's response to comment 229 committed to adding additional bedrock contours so that all contours would be at 5-foot intervals. The figure has not been revised.

Figure 3.3-2 and Figure 3.3-3: Several previous requested edits have been incorporated from previous comment 230. However, two edits have not been made. 1. EPA would prefer to see a slightly more zoomed-in version of the figure, such as a 1":500' scale. 2. The groundwater divide has been moved slightly south, but is still depicted as being 200' north of a groundwater high (as shown by the 84' contour). EPA understands that groundwater flow in this area is complex because of ongoing pumping, but the groundwater divide should be moved to the south in the area west of Plant B. Otherwise the figure implies that groundwater is moving uphill west of Plant B.

Figure 3.3-5: The capped area should also be classified as impervious surface material.

Figure 4.1-29: The USGS background study needs a reference and the figure appears to be poorly reproduced/explained, as neither the x nor y axes are displayed.

Figure 5.0-1: The CSM depicts groundwater transport to surface water, but not other potential sources and transport pathways for soil, surface water and sediment. These pathways include surface water migration, overland flow across surface contamination, and percolation/leaching of contaminants in the soil to groundwater.

Previous Comment 237, additional Section 4 surface water figures: Olin/AMEC asserted that arsenic did not exceed its AWQC and that manganese does not have an AWQC. These are incorrect. Arsenic was detected in the off-PWD, Landfill Brook, East Ditch, and MMB; and exceeded the AWQC in all samples. Manganese does have an AWQC, and all of the samples in the off-PWD, East Ditch, and Landfill Brook exceeded this level. Please show arsenic and manganese surface water results on separate, new figures.

ATTACHMENT D

Attachment D: The surface water results (Table 4) should include the AWQC for comparison.

Attachment D: The text describes a number of reports on sites near North Pond, as well as previous documents for this Site. All reports should be referenced and a separate reference section developed.

APPENDIX J

Comment 19: Olin/AMEC response to previous comment 221 suggested that Olin compared actual distribution of soil data to actual distribution of groundwater data to eliminate leaching as a significant transport pathway (except for TMPs). In the original response, EPA provided a list of contaminants with more than 10 detections in a given depth interval which *also* had an average concentration above the SSL. EPA has performed a comparison of those analytes to actual groundwater concentrations for all monitoring wells and for only shallow on-Site monitoring wells as described in Appendix J. Using just the most recent results for any given analyte at each well, EPA determined that several analytes that exceeded SSLs also exceeded groundwater screening levels and should be evaluated using figures to determine if those groundwater concentrations are in the vicinity of the soil concentrations. These additional figures and evaluation of leaching potential based on the figures should be added to Appendix J and Section 5 as needed. These include chromium, manganese, arsenic, cobalt, iron, and NDPA. The analysis, detailed methods, and results are included in Attachment B.

Note: Appendix J has been carried over entirely unchanged from the draft RI. The following comments have been carried over from the draft RI.

Response 221: (leaching initial screening – Olin/AMEC balked, so I went through the GW screening using their metrics with the contaminants I identified in the original comments).

Response 222: The initial response requested the following explanation of leaching mechanisms:

1. Areas of potential percolation (impermeable vs permeable surfaces)
2. Depth of groundwater (zones of potential groundwater flow)

Olin/AMEC stated twice that they would add a discussion of leaching mechanisms. Please do so.

Response 223: Olin/AMEC committed to revising the text of Appendix J.

Response 224: Olin/AMEC committed to revising the text of Appendix J.

Response 225: Olin/AMEC committed to revising the text of Appendix J.

Response 226: Olin/AMEC committed to revising the text of Appendix J.

REVIEW OF
DRAFT FINAL REMEDIAL INVESTIGATION REPORT
FOR OPERABLE UNIT 1 AND OPERABLE UNIT 2
APPENDIX M - DRAFT FINAL HUMAN HEALTH RISK ASSESSMENT
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

Nobis Engineering, Inc., on behalf of the U.S. Environmental Protection Agency (EPA), has reviewed and generated the following observations on the "*Draft Final Human Health Risk Assessment, Operable Unit 1 and Operable Unit 2",* prepared by AMEC Environmental and Infrastructure, Inc., on behalf of the Olin Corporation (Olin) for the Olin Chemical Superfund Site (Site) in Wilmington, Massachusetts. As requested by EPA, the "*Draft Final Human Health Risk Assessment, Operable Unit 1 and Operable Unit 2*" was submitted on April 10, 2014 as Appendix M of the *"Draft Final Remedial Investigation Report, Operable Unit 1 and Operable Unit 2"*. Comments below provide review of this Draft Final HHRA.

HUMAN HEALTH RISK ASSESSMENT MAJOR COMMENTS:

1. *The text in Section 6.5 states: "Risks at or below 10^{-4} do not generally warrant a response action. Risks greater than 10^{-4} generally warrant development and evaluation of remedial alternatives." EPA cleanup actions can be triggered with risks at 10-6; however, cleanup decisions are based on a review of total risks at a site. Please remove this statement or modify it to reflect that a broader EPA policy risk management decision may be determined.*

2. *Because of the limited dataset used (incomplete analyte sampling and unknown depths of samples), the prior submittal to EPA was not adequate to establish that there are no future risks from exposures to subsurface soils in this area in the absence of a permanent cap. Therefore, if an evaluation of future exposures to subsurface soils at the containment area is to be included, it must be based on a more comprehensive dataset than what is currently available. As stated in Section 1.0, "The objective of the HHRA is to characterize health risks to human populations that are assumed to be potentially exposed to chemicals of interest (COIs) associated with historical operations at the Property under the current and foreseeable future uses of the Site,* ***in the absence of any additional remedial measures****." The permanent cap is an additional remedial*

measure that has not been installed; a final decision on the need for an evaluation of the cap soils is pending with EPA. Calculations of future exposures to subsurface soils at the containment area have been referenced in the text, but have not been provided in the HHRA. Please provide this evaluation in the HHRA or eliminate reference to them.

3. Olin defines “Contaminants of Interest” or COIs as “chemicals that have been associated with the former facility (as a raw material, product, or a constituent of waste streams or accidental releases) and that have been released to one or more environmental media.” Please modify this definition to include all substances that are/were raw materials, reactants, intermediates, products, by-products, or waste products associated with onsite process or manufacturing operations, releases, discharges, or emissions, and any substance that resulted from the degradation or transformation by biotic or abiotic processes of released substances. Note that anything detected in DAPL is also a COI as are PAHs, EPH/VPH, etc. Please provide a table listing the COIs.

4. Data results presented in Attachment 2 are inconsistent with RI Appendix E data validation reports and COPC selection tables. It appears the error lies within Attachment 2. Since Attachment 2 is the only presentation of all the data used in the HHRA, the apparent error makes it impossible to verify EPCs and calls into question the risk calculations.

5. The chromium evaluation presented in Attachment 7 is critical to the understanding of chromium speciation in site media. However, concerns with the data included are noted.

    a. There are samples presented in Table 1 of Attachment 7 that are not presented in Attachment 2.
    b. Concentrations presented in Attachment 7 do not match consistently with concentrations for the same sample in Attachment 2.
    c. Sediment data from Table 2-30 (North Pond) has not been incorporated into the chromium and hexavalent chromium comparison for sediment.

6. There are concerns regarding exposure point concentrations (EPCs), methodology, equations, exposure assumptions, and or toxicity factors. Because the data displayed in Attachment 2 in Appendix M (Interim Deliverable #3) does not agree with Appendix E of

the RI (contains all data from 2009 to 2013), EPCs could not be confirmed. Olin/AMEC needs to confirm the validity of the data in Attachment 2 and rerun the EPC calculations, if needed.

Recalculations of risk for scenarios that presented the highest overall cancer risks were revised using the EPCs developed by Olin to incorporate the following revisions:

- Revising the SA to be consistent with the methodology presented in Tables 3.3-6 and 3.3-7, as well revising the body parts to include: head, forearms, hands, lowerlegs, and feet for both the adult and adolescent trespasser.
- Inclusion of the dermal ABS values presented in the EPA RSL table (November 2013).
- Inclusion of NJDEP CSF for hexavalent chromium.
- Inclusion of revised UCL for Aroclor 1260 for small area of PCB results.
- Inclusion of VF from RSL table rather than the PEF for VOCs in soil.
- Inclusion of DAevent in surface water dermal pathway.
- Inclusion of EPA revised vanadium RfDs.
- Inclusion of maximum in place of UCL in instances with small dataset.

In addition, the mutagenic mode of action approach for additional contaminants, and TCE and vinyl chloride specific equations were considered. Resulting risk estimates increased for some scenarios; however, the increases were not great enough to change the conclusions of the risk assessments.

7. Clarification and/or changes in assumptions or methods are needed as follows:

   a. Please provide an explanation of how exposure point concentrations were determined for small data sets and how non-detects were handled. Please provide the ProUCL inputs in excel spreadsheets showing sample IDs and chemical concentrations to allow EPA confirmation of EPCs.

   b. Please calculate inhalation risks from volatiles in shallow soil by using a volatilization factor rather than a PEF to determine air concentrations.

c. In addition to the list of COPCs with an identified mutagenic mode of action provided, contaminants that act via a mutagenic mode of action also include benzo(k)fluoranthene, chrysene, hexavalent chromium, NDMA, TCE, and vinyl chloride. It appears cancer risks for benzo(k)fluoranthene and chrysene were evaluated accounting for the mutagenic mode of action. However, adolescent trespasser cancer risks for hexavalent chromium, NDMA, TCE, and vinyl chloride need to be revised to account for their mutagenic mode of action.

d. TCE was selected as a COPC in surface water. Unique equations are used for the evaluation of childhood exposures to TCE. Please add a sub-section to discuss the equations used to evaluate trespasser risks to TCE in surface water. Cancer risks will also need to be updated to account for this evaluation.

e. Risk calculations for hexavalent chromium using the Tier 3 oral CSF from the New Jersey Department of Environmental Protection (NJDEP) are discussed in the uncertainty section. However, the calculations were not provided. In addition to providing calculations, please expand this discussion to include trespasser cancer risks to hexavalent chromium using the NJDEP CSF, as well as apply an ADAF for mutagenic mode of action.

f. Please revise the surface area calculations presented in Tables 3.3-6 and 3.3-7 to include the head, forearms, hands, lowerlegs, and feet for both the adult and adolescent trespasser and correct trespasser skin surface areas on Tables 3.3-1 and 3.3-2 (and those used in the risk calculations) to match these re-calculated surface areas.

g. Please correct the formula for dermal contact with surface water presented in Table 3.3-4. The dermal exposure to surface water pathway should include the DAevent parameter, as presented in Appendix A of EPA's RAGS Part E guidance document. It is unclear what the PCevent term is used for and where the referenced PCevent table is presented.

h. Please present chemical-specific dermal ABS factors used in the calculation of dermal exposures.

i. Please use the vanadium and compounds RfD presented in EPA Regional screening Level Tables (5.0E-3 mg/kg/day) and revise the HHRA Table 4.2-1 and Attachment 11 tables to be consistent in the use of RfDs for vanadium.

8. The uncertainty section lacks discussion of several important contributors to uncertainty:

   a. Please include discussion of potential COIs without available analytical methods, such as Nitropore OT and Nitropore 5T, which were therefore not analyzed for and not evaluated in the RI or HHRA.

   b. Please include discussion of potential impacts of evaluating the small area of PCB contamination as part of the larger EA1 area, with potential underestimation of EPCs and risks resulting from including numerous non-detects from the larger area in the 95%UCL calculation.

   c. Please provide a complete list of COPCs without published toxicity values, for example, 4-isopropyltoluene, carbazole, dimethylphthalate, delta-BHC, and Kempore should be included in the uncertainty discussion.

   d. The uncertainty discussion does not include but should discussion of the EA1 subdivision memos (attachment 13) and support for keeping former manufacturing and former waste disposal areas of EA1 as a single large exposures area.

HUMAN HEALTH RISK ASSESSMENT GENERAL COMMENTS:

9. Numerous abbreviations are used in the text without definition upon first use within the HHRA. For example, page 1-1 RI, page 1-4 IRSWP, page 1-5 DAPL, page 1-6 UST, page 1-6 On-PWD, page 1-6 LNAPL, page 1-6 EPH/VPH, page 1-7 RSL,…

10. Numerous areas of the text would be enhanced by reference to a figure, another section of the text, an attachment, or a section of the RI. For example, Section 1.2 - Page 1-3 reference Attachment 13; Section 1.3 - Page 1-3 reference Attachment 3 and a figure showing locations of the deed restrictions; Section 1.5.2 - Page 1-5 reference a figure or

figures showing potential source areas; Section 1.5.2 - Page 1-6 reference a figure showing the Western Bedrock Valley; Section 2.2.1 - Page 2-9 reference a figure showing the EPH/VPH area and the locations of samples listed on Attachment 1C, Table 1; Section 2.3 - Page 2-20 reference Attachment 7 in the paragraph about chromium; Section 3.1.1 - Page 3-3 reference a figure for the 2006 deed restriction;…

11. Some prior comments with agreed to changes, have not been addressed. Please check that all agreements from prior responses to comments on the draft HHRA interim #2 have been incorporated. For example, EPA requested addition of rationale for trespasser scenarios with no inhalation of dust, i.e. pavement, vegetative cover, and/or wetland on Tables 1.2-1 and/or 1.2-2.

12. Corrections of typos (or apparent typos), grammar/wording issues, and instances where slightly more wording would improve clarity should be made; For example, Section 1.5.2. Page 1-5. Check wording in second bullet – words about off-Property portion of the upper DAPL pool seem missing. However, aside from this example, such instances are not called out in specific comments unless the wording is crucial.

13. Further support is needed for some decisions/statements:

    a. Please add to discussion of the expected future property use that industrial use is consistent with surrounding properties.
    b. Please add a discussion for areas that are not considered exposure areas (Pan Am Railway, Landfill Brook) explaining why not to the page 2-7 discussions.
    c. Please include a summary of the conclusions of Attachment 13 supporting the treatment of EA1 as a single large exposure area.

14. Regarding the CSL, are there permanent provisions for maintaining the soil cover and preventing future exposures to contaminated soil at the CSL?

15. The HHRA does not include an evaluation of future Vapor Intrusion except to note that vapor-producing parameters are present in vadose zone soil in areas EA3, EA7, and the former Lake Poly, and the containment area. Discussion of potential approaches to addressing this concern are limited to statement that “For future vapor intrusion

concerns, if construction of occupied structures is proposed, a soil vapor investigation will be conducted to evaluate the need for mitigation or remediation to address the vapor intrusion pathway and/or engineering controls and institutional controls will be implemented to eliminate or minimize the vapor intrusion pathway."

a. Further discussion of remedial options for addressing the concern, including a deed restriction requiring evaluation or mitigation systems, is requested.
b. Please discuss the lack of evaluation of future vapor intrusion at existing buildings (unoccupied) on site.

16. OU1/OU2 statements/issues/changes to guidance impacting OU3:

17. Please note that the deed restriction prohibiting use of groundwater at the Site as drinking water will not serve to avoid evaluation of future use of groundwater at the Site as drinking water in OU3.

18. Note that determination of cumulative risks require the exposures calculated in this OU1/OU2 HHRA to be added to those to be evaluated under OU3 in cases of the same receptor exposed to OU1/OU2 media and OU3 media. For example, soil exposures for indoor workers calculated in this OU1/OU2 HHRA must be added to the VI path evaluated under OU3.

19. EPA has issued new supplemental guidance on exposure factors (OSWER Directive 9200.1-120, February 2014). This directive updates exposure factors shown in earlier guidances to be consistent with the exposure factors presented in the 2011 Exposure Factors Handbook. In general changes presented would serve to lower exposures and risks in the OU1/OU2 HHRA. EPA is not requesting changes to the factors used for the Olin OU1/OU2 HHRA as they have been previously agreed to and changes would not alter the conclusions of the OU1/OU2 HHRA. However, EPA recommends this directive be used for OU3.

SECTION 1.0 SPECIFIC COMMENTS:

20. Section 1.0. Page 1-1. Olin defines “Contaminants of Interest” or COIs as “chemicals that have been associated with the former facility (as a raw material, product, or a constituent of waste streams or accidental releases) and that have been released to one or more environmental media.” Please modify this definition as indicated above and provide a table listing the COIs. Also please confirm that all COIs included in the list of COPCs (Section 1.5.4, Page 1-7) are bolded.

21. Section 1.0. Page 1-1. Please remove Risk Updates, EPA Region 1 from the list of guidances. These regional updates have been superseded by national guidance.

22. Section 1.4. Page 1-4. Olin states “the RI successfully characterized the nature, extent, and fate and transport associated with the detected constituents in the various media at OU1 and OU2.” Please see comments on Sections 4.0 and 5.0 of the RI.

23. Section 1.5. Page 1-4 through 1-10. This section summarizes the Conceptual Site Model discussed in Section 5.0 of the RI. Please see comments on Section 5.0 of the RI.

24. Section 1.5.1. Page 1-5. Please include EPH/VPH in the constituents in liquid waste streams and unintentional releases paragraph.

25. Section 1.5.1. Page 1-5. At the end of the paragraph discussing constituents in liquid waste streams and unintentional releases, Olin states “Based on that information, the chemicals identified in the preceding sentences are considered primary COIs for OU1 and OU2.” It is not clear whether this sentence refers only to chemicals discussed in this paragraph or also those listed in the preceding paragraphs discussing products produced and raw materials used. Please clarify in the text. A table listing the COIs would be helpful. Also please note potential breakdown products and the constituents of DAPL should be considered COIs.

26. Section 1.5.2. Page 1-5. Check wording in second bullet – words about off-Property portion of the upper DAPL pool seem missing.

27. Section 1.5.4. Page 1-6. Olin states “Horizontal and vertical delineation of COIs has been accomplished, at the perimeter and in the interior of the Property (OU1) for surface soil and shallow subsurface soil.” Please see comments on Section 4.0 of the RI.

28. Section 1.5.4. Page 1-7. Please add “or equivalents” after RSLs in the first sentence at the top of page 1-7.

29. Section 1.5.4. Page 1-7. Olin bolded COIs. Please bold hydrazine, formaldehyde, nitrate, nonylphenol, zinc, and EPH/VPH compounds.

30. Section 1.5.5. Page 1-8. Please discuss Kempore and hydrazine detections in MMBW.

31. Section 1.5.5. Page 1-9. Please discuss Landfill Brook.

32. Section 1.5.6. Page 1-9. Please add into the first sentence that surrounding properties are also industrial, therefore future industrial use is consistent with surrounding property use. Also please reference a figure showing deed restriction areas and on-Property site features.

33. Section 1.5.7. Page 1-10. Please add to first paragraph that further discussions of exposure areas are in Section 2.1.

SECTION 2.0 SPECIFIC COMMENTS:

1. Section 2.1. Page 2-3. Please note that the deed restriction prohibiting use of groundwater at the Site as drinking water will not serve to avoid evaluation of future use of groundwater at the Site as drinking water in OU3.

2. Section 2.1. Page 2-4. The listing of OU2 exposure areas does not include the Pan Am Railway soils. Please add a short discussion in the first paragraph on page 2-4 and slightly longer discussion in the bullets for areas that are not exposure areas on page 2-7 explaining why not. The qualitative evaluation on page 2-11 could be moved here. Please reference a figure showing sample locations for this area.

3. Section 2.1. Page 2-4. The listing of OU2 exposure areas does not include Landfill Brook. However, its evaluation is carried through the COPC selection step. Please retain it in the list of OU2 exposure areas on page 2-4 and move the bullet discussing it on page 2-7 to the OU2 exposure areas. Add further discussion to that bullet, explaining the determination in the RI that this area is not impacted by the site. Please see comments on the RI. Also please include New Boston Street, MBTA rail line, and NSTAR property referenced in the existing bullet on a figure.

4. Section 2.1. Page 2-4. Please provide a brief summary within the EA1 bullet (a sentence or two should do) of the conclusions of the Attachment 13 memos.

5. Section 2.1. Pages 2-4 through 2-7. For the predominantly wetland exposure areas (EA2, EA4, EA6, and EA5), please add “Shallow subsurface soils are in the saturated zone and therefore are not evaluated. Subsurface contamination will be evaluated under OU3.” It would also be helpful to add, if true, that surface soil results show no evidence of past waste disposal or significant contamination.

6. Section 2.1. Page 2-5. Please add a statement to the EA6 bullet on page 2-5 that Central Pond, the Stormwater Detention Basin, and South Ditch, are separate exposure points within EA6 and provide separate rows for each of these exposure points on Table 1.2-1.

7. Section 2.1. Page 2-5. The end of the 2nd paragraph regarding the containment area bullet, states: "Future exposures to subsurface soils in the absence of a permanent cap have previously been evaluated to aid in determining a permanent remedy." These calculations have not been accepted by EPA. Please eliminate the reference to them or provide a revised evaluation in the HHRA. JIM?? See comment #2 above.

8. Section 2.1. Pages 2-5 through 2-6. The six bullets for the containment area should be presented as a single bullet with multiple paragraphs.

9. Section 2.1. Page 2-6. Figure 2.3-1 is not in the Draft RI, but rather in the HHRA.

10. Section 2.1. Page 2-6. Please remove the statement: “The identified exposure scenario will be revisited upon completion of on-going discussions between Olin and USEPA.”

11. Sections 2.2.1 and 2.2.2 (Pages 2-8 through 2-11) and Figure 2.3-2. There is no subsurface soil evaluation (1-10 ft depth) at EA2, EA4, EA5, EA6, and off-PWD. Please clearly state in the HHRA Sections 2.2.1 and 2.2.2 that soils from these depths in EA2, EA4, EA5, and EA6 are not evaluated in the OU1/OU2 RI, HHRA, and ERA because they are below the water table and contamination in saturated soils will be addressed under OU3. EPA will be reviewing groundwater sampling under OU3 to be certain it is adequate to evaluate contamination in these areas below the water table.

12. Section 2.2.1. Page 2-10. The statement is made that samples collected **after** the AS/SVE system operation was completed are **NOT** included in the HHRA. Is this a typo?

13. Section 2.2.1. Page 2-10. In the fifth bullet on Page 2-10, please reference a figure showing the locations of RSD-11 through RSD-15. Also, the statement is made that RSD-09 and RSD-10 were collected just **east** of the soil background area. Is this a typo? Aren’t they to the west?

14. Section 2.2.2. Page 2-11. In the second bullet, please reference a figure showing the Pan Am Railway samples. The text states that RSLs are shown on Attachment 1F, Table 5. However, RSLs and exceedances are not shown on the table.

15. Section 2.2.6. Page 2-14. Under pre-CERCLA, Is “1996 to **present”** a typo?

16. Section 2.2.6. Page 2-16. The section titled Data Quality and Usability - pre-CERCLA seems to apply to all data pre-CERCLA and more recent. Please revise title.

17. Section 2.2.6. Page 2-17. Two bullets cite the Final Supplemental Work Plan (AMEC, 2013b). Reference should be (AMEC, 2013c).

18. Section 2.3. Page 2-19. The reference to Figure 2.1-3 should be 2.1-1.

SECTION 3.0 SPECIFIC COMMENTS:

1. Section 3.0. Page 3-2. Please add the containment area to the future use OU1 outdoor worker and construction worker subsurface soil scenarios. JIM?? See comment #2 above.

2. Section 3.1.1. Page 3-3. After Restrictive Covenant, please add "and surrounding area land use" to the 2nd paragraph on Page 3-3.

3. Section 3.1.1. Page 3-3. The EA1 discussion would be a good place to reference and summarize Attachment 13.

4. Section 3.1.1. Page 3-7. Page 3-7 states "All remedial alternatives considered for OU1 will include the installation of a permanent cap on the Containment Area." As stated in Section 1.0, "The objective of the HHRA is to characterize health risks to human populations that are assumed to be potentially exposed to chemicals of interest (COIs) associated with historical operations at the Property under the current and foreseeable future uses of the Site, **in the absence of any additional remedial measures**." The permanent cap has not been installed. Please present an evaluation of future worker exposures to subsurface soils in the containment area in the HHRA and expand the discussion of the containment area exposures to include future worker exposures to subsurface soils. These calculations are not presented. Prior calculations have not been accepted by EPA. Please provide a revised evaluation in the HHRA. JIM?? See comment #2 above.

5. Section 3.1.1. Page 3-7. The section on Potential Vapor Intrusion does not include an evaluation of future Vapor Intrusion except to note that vapor-producing parameters are present in vadose zone soil in areas EA3, EA7, and the former Lake Poly, and the containment area. Discussion of potential approaches to addressing this concern are limited to statement that "For future vapor intrusion concerns, if construction of occupied structures is proposed, a soil vapor investigation will be conducted to evaluate the need for mitigation or remediation to address the vapor intrusion pathway and/or engineering controls and institutional controls will be implemented to eliminate or minimize the vapor intrusion pathway."

6. Further discussion of remedial options for addressing the concern, including a deed restriction requiring evaluation or mitigation systems, is requested.

7. Please discuss the lack of evaluation of future vapor intrusion at existing buildings (unoccupied) on site.

8. Section 3.1.2. Page 3-7 and 3-8. Exposures to groundwater at the property, including DAPL, as potable water will be considered under OU3. Direct exposures of construction workers to shallow groundwater and volatiles in trenches will be considered a viable pathway under OU3.

9. Section 3.2. Page 3-11. Please provide an explanation of how exposure point concentrations were determined for small data sets and how non-detects were handled. Please provide the ProUCL inputs in excel spreadsheets showing sample IDs and chemical concentrations to allow EPA confirmation of EPCs.

10. Section 3.3. Page 3-12. This assessment includes calculations of risks from inhalation of soil dust, but no evaluation of exposures to volatiles in soil (inhalation of soil vapors during outdoor activities). Please calculate risks from volatiles in shallow soil by using a volatilization factor rather than a PEF to determine air concentrations.

11. Section 3.3.1. Page 3-13. Note the soil exposures for indoor workers calculated in this OU1/OU2 HHRA must be added to the VI path evaluated under OU3.

12. Section 3.3.2. Page 3-14. Please add “and reasonable maximum exposure parameters” to the end of the first paragraph.

SECTION 4.0 SPECIFIC COMMENTS:

1. Section 4.1.3. Page 4-5. Please clarify in the text that ADAFs have been “applied to” CSFs means CSFs are multiplied by ADAFs. Please add South Ditch, Central Pond, and Stormwater Detention Basin to the list of exposure areas where trespassers are evaluated. Contaminants that act via a mutagenic mode of action also include

benzo(k)fluoranthene, chrysene, hexavalent chromium, NDMA, TCE, and vinyl chloride. Please add these to the list of COPCs with an identified mutagenic mode of action. It appears cancer risks for benzo(k)fluoranthene and chrysene were evaluated accounting for the mutagenic mode of action. However, adolescent trespasser cancer risks for hexavalent chromium, NDMA, TCE, and vinyl chloride need to be revised to account for their mutagenic mode of action.

2. Section 4.1.3. Page 4-5. TCE was selected as a COPC in surface water. Unique equations are used for the evaluation of childhood exposures to TCE. Please add a sub-section to discuss the equations used to evaluate trespasser risks to TCE in surface water. Cancer risks will also need to be updated to account for this evaluation.

SECTION 5.0 SPECIFIC COMMENTS:

1. Section 5.1.1. Pages 5-1 and 5-2. Please add sentences noting that for receptors exposed to multiple media, risks from each medium are added to obtain total receptor ELCRs and hazards. Also please add a sentence noting that OU1/OU2 risks will be added to OU3 risks where appropriate (i.e. vapor intrusion risks from groundwater migration will be added to soil exposure risks calculated under this HHRA.)

2. Section 5.1.1. Page 5-2. Following statement made: "Risks at or below 10^{-4} do not generally warrant a response action. Risks greater than 10^{-4} generally warrant development and evaluation of remedial alternatives." JIM okay with that statement?? See comment #2 above.

3. Section 5.2.2.3. Page 5-4. Please add a sentence presenting cumulative trespasser risks from soil and sediment exposures in EA2.

4. Section 5.2. Pages 5-2 to 5-10 and Section 6.0 versus risk results presented in Tables 5.2-1 and 5.2-2 and Attachments 11 and 12.

    a. The total HI for trespassers for all areas/media should be clarified in both text and summary tables to indicate that it represents total HI for the more sensitive receptor

(adolescent trespassers), whereas total cancer risks for trespassers represents cumulative risks from both adolescent and adult years.

b. Section 5.2.2.3. Page 5-4. Please add a sentence presenting cumulative trespasser risks from soil and sediment exposures in EA2.
c. Section 5.2.9.1, second paragraph, first sentence, please revise 5E-05 to be 8E-05.
d. Section 6.0, Current Land Use – OU2 and Future Land Use – OU2, delete “Surface Water at EA5” for the second and third bullets.

5. Section 5.2.9. Page 5-9. The only HHRA actionable risks are trespassers exposed to PAHs in surface water at off-PWD and those are dismissed as not associated with OU1. Please discuss source of these contaminants.

6. Section 5.3.1.1. Page 5-12. Please include discussion of potential COIs without available analytical methods, such as Nitropore OT and Nitropore 5T, which were therefore not analyzed for and not evaluated in the RI or HHRA.

7. Section 5.3.2. Page 5-12. Please include discussion of potential impacts of evaluating the small area of PCB contamination as part of the larger EA1 area, with potential underestimation of EPCs and risks resulting from including numerous non-detects from the larger area in the 95%UCL calculation. A revised UCL based on the small area of PCB contamination would result in a value of 7.4 mg/kg, as compared to the value of 1.8 mg/kg currently being used in the HHRA.

8. Section 5.3.2.1. Page 5-12. Please explain further why there is no evaluation of subsurface soils in EA2, EA4, and EA6 (wetland, subsurface soils in saturated zone, etc.)

9. Section 5.3.3.1. Page 5-14. Please provide a complete list of COPCs without published toxicity values, for example, 4-isopropyltoluene, carbazole, dimethylphthalate, delta-BHC, and Kempore should be included here.

    a. Section 5.3.3.3. Page 5-17. Risk calculations using the Tier 3 oral CSF from the New Jersey Department of Environmental Protection (NJDEP) for hexavalent chromium are discussed in this section. Please provide the calculations and expand this

discussion to include trespasser cancer risks to hexavalent chromium using the NJDEP CSF. For adolescent trespasser risks, please apply an ADAF for mutagenic mode of action.

10. Section 5.3. Pages 5-11 to 5-17. The uncertainty discussion does not include, but should, discussion of the EA1 subdivision memos (attachment 13) and support for keeping former manufacturing and former waste disposal areas of EA1 as a single large exposures area.

SECTION 7.0 SPECIFIC COMMENTS:

1. Section 7.0. Page 7-3. The exposure parameter tables reference the 2011 Exposure Factor Handbook, rather than the earlier 1997 version. Please delete the 1997 citation from the reference list.

FIGURES, TABLES, AND ATTACHMENT SPECIFIC COMMENTS:

1. Figure 1.2-4 – Please **delineate the extent** of the following surface water/sediment exposure areas: On-Property West Ditch, Off-Property West Ditch, Central Pond, Stormwater Detention Basin, Upper South Ditch, Lower South Ditch, East Ditch, MMBW, and Landfill Brook. Please also show the location of the Pan Am Railway soil sampling.

2. Figures 2.3-1 and 2.3-2 – The EA1 Exposure Areas should be consistent with that shown on Figure 1.2-4. Please also show the locations of the Pan Am Railway soil samples.

3. Tables 1.2-1 and/or 1.2-2. Please add rows for future worker exposures to subsurface soils at the containment area. (See Comment No. 2 above.) Please add rationale for trespasser scenarios with no inhalation of dust, i.e. pavement, vegetative cover, and/or wetland.

4. Tables 3.2.1 through 3.2.4. Exposure point concentration tables – EPA's ProUCL guidance does not recommend calculating UCLs with small sample sizes - typically less than 8-10 samples. In several instances throughout the HHRA, EPCs have been defaulted to the UCL for small data sets. It is recommended that the maximum detected

concentration be used as the EPC in instances where datasets are too small for a statistically reliable UCL to be calculated.

5. Exposure parameter tables.

   a. Tables 3.3-1 through 3.3-5. EPA has issued new supplemental guidance on exposure factors (OSWER Directive 9200.1-120, February 2014). This directive updates exposure factors shown in earlier guidances to be consistent with the exposure factors presented in the 2011 Exposure Factors Handbook. In general changes presented would serve to lower exposures and risks in the OU1/OU2 HHRA. EPA is not requesting changes to the factors used for the Olin OU1/OU2 HHRA as they have been previously agreed to and changes would not alter the conclusions of the OU1/OU2 HHRA. However, EPA recommends this directive be used for OU3.

   b. Tables 3.3-1 through 3.3-5. Please include volatilization factors (VF) in equations for evaluating inhalation intakes from volatile surface soil contaminants.

   c. Tables 3.3-1 through 3.3-5. Please reference the supporting documentation for older child and adult trespasser skin surface area (Tables 3.3-6 and 3.3-7) in the footnotes of these tables. Please revise the surface area calculations presented in Tables 3.3-6 and 3.3-7 to include the head, forearms, hands, lowerlegs, and feet for both the adult and adolescent trespasser and correct trespasser skin surface areas on Tables 3.3-1 and 3.3-2 (and those used in the risk calculations) to match these re-calculated surface areas.

   d. Tables 3.3-2 and 3.3-3. Please reference the supporting documentation for construction worker PEF (Table 3-3.8) in the footnotes of these tables.

   e. Tables 3.3-2 and 3.3-3. The dermal adherence factor for an indoor worker is presented as a value of 0.07 mg/cm^2-event and for an outdoor worker is presented as a value of 0.2 mg/cm^2-event in Table 3.2-2 and the reference for these values is cited as *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*. Please reference the EPA Dermal guidance (EPA, 2004) dermal adherence

factors of 0.2 mg/cm^2-event for utility workers for the outdoor worker exposure scenario and 0.07 mg/cm^2-event for pipe layers (dry soil) for the indoor worker.

f. Table 3.3-4 – Please correct the formula for dermal contact with surface water. The dermal exposure to surface water pathway should include the DAevent parameter, as presented in Appendix A of EPA's RAGS Part E guidance document. This exposure route should be revised to include this parameter. Additionally, it is unclear what the PCevent term is used for and where the referenced PCevent table is presented.

6. Toxicity factor tables.

   a. Table 4.1-1. Please present the New Jersey Department of Environmental Protection (NJDEP) oral cancer slope factor (CSF) of 5.0E-1 (mg/kg-d)$^{-1}$ for hexavalent chromium used in the uncertainty section (an added row footnoted would be acceptable).

   b. Table 4.2-2. Please clarify the source "REL" (cited for mercury as mercuric chloride). Also please add 1997 to the footnote for HEAST on all four toxicity tables. Also please add the reference for HEAST to the Section 7.0 reference list.

   c. Table 4.2-1. Aroclor-1260's source indicates "Surrogate (2)" referencing the RfD for Aroclor-1254. Please clarify in the footnote the source of the RfD for Aroclor 1254.

7. Risk Summary tables. Tables 5.2-1 and 5.2-2. The total HI for trespassers for all areas/media should be clarified in these summary tables to indicate that it represents total HI for the more sensitive receptor (adolescent trespassers), whereas total cancer risks for trespassers represents cumulative risks from both adolescent and adult years.

8. Attachment 1. Attachment 1 provides a comparison of historical soil data and RI soil data, relying on seven specific contaminants. The explanation of why these seven were selected is needed in the attachment. Please add the following statement (added to the text in Section 2): "The seven specific contaminants were selected because they are frequently detected contaminants in soil at OU1 and OU2 and some are signature COIs.

In addition, the parameters were selected to represent different chemical classes (e.g. benzo(a)pyrene represents PAHs).”” to Attachment 1 of the HHRA.

9. Attachment 1F - Section 2.2.2. Page 2-11 text states that RSLs are shown on Attachment 1F, Table 5. However, RSLs and exceedances are not shown on the table.

10. Attachment 2: Data results are inconsistent with RI Appendix E data validation reports and COPC selection tables. For example, the maximum arsenic concentration in subsurface soil is listed as 16 mg/kg on Table 2.3-2 but in Attachment 2, higher concentrations were found. Higher concentrations presented in Attachment 2 range from 17 mg/kg to 75 mg/kg. Upon further inspection against validated data presented in RI Appendix E, data results are incorrect in Attachment 2. It appears that some concentrations have been shifted upwards. There is no way of determining if the correct data has been incorporated in the COPC screening process, as well as the EPC calculations. This error has the potential to significantly impact HHRA results. Furthermore, RI Appendix E does not present data earlier than 2009 to confirm data results prior to 2009. This combination makes it impossible to verify EPCs.

11. Attachment 3. The extent of the area covered by the 2006 covenant is needed on a clearer figure.

12. Attachment 7. Chromium evaluation:

    a. There are samples presented in Table 1 of Attachment 7 that are not presented in Attachment 2. Examples include Off-property samples from March 2013, OC-SB-473 (6-8), and NPSB1 through NPSB4. This raises concerns over whether the HHRA incorporates all available data with no way of determining what other samples may have been excluded.
    b. Concentrations presented in Attachment 7 do not match consistently with concentrations for the same sample in Attachment 2. For example, Sample 101B in Attachment 2 shows 19.9 mg/kg chromium and no results for hex chromium, but attachment 7 shows 2130 mg/kg chromium and 19.9 hex chromium.
    c. Sediment data from Table 2-30 (North Pond) has not been incorporated into the chromium and hexavalent chromium comparison for sediment.

d. Surface water and sediment chromium and hexavalent chromium comparison are not addressed in the text.

13. Attachment 8. Please address comments previously agreed to in RtCs.

    a. A figure showing the locations listed on Table 1 with the maximum PID screening results for each location would be helpful.

    b. Tables 4 through 9 have shading. Please add a footnote explaining what the shading indicates. Attachment 8 text indicates the purpose of shading for Tables 6 and 7. Please add an explanation in the text for shading on Tables 4, 5, 8, and 9.

    c. This attachment uses 1 ppmv PID readings and 1 mg/kg total VOC concentrations in soils as means of identifying areas/samples of potential VI concern. Please provide the basis of selection of these comparison levels.

14. Attachment 11.

    a. If a bioavailability factor was used for ingestion of arsenic, this should be discussed in the text and indicated on tables. Arsenic calculations could only be duplicated when a bioavailability factor of 0.6 was applied.

    b. Dermal pathways for the soil and sediment scenarios could not be replicated. Dermal ABS values should be included as a table in the HHRA and should be incorporated into calculations for dermal exposure to soil and sediment.

    c. Table 4.2-1 presents Region 1 specific RfDs (ingestion and dermal) for vanadium. The non-cancer HIs presented in Attachment 11 do not incorporate these values. Please use the vanadium and compounds RfD presented in EPA Regional screening Level Tables (5.0E-3 mg/kg/day) and revise the HHRA Table 4.2-1 and Attachment 11 tables to be consistent in the use of RfDs for vanadium.

2. Attachment 13. Attachment 13 is missing the February 11, 2014 EA1 Subdivision Evaluation Including Additional EA2 Locations Memo.

REVIEW OF
DRAFT REMEDIAL INVESTIGATION REPORT
FOR OPERABLE UNIT 1 AND OPERABLE UNIT 2
DRAFT FINAL ECOLOGICAL RISK ASSESSMENT - INTERIM DELIVERABLE #3
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

Nobis Engineering, Inc., on behalf of the U.S. Environmental Protection Agency (EPA), has reviewed and generated the following observations on the "*Draft Final Baseline Ecological Risk Assessment, Operable Unit 1 and Operable Unit 2",* prepared by AMEC Environmental and Infrastructure, Inc., on behalf of the Olin Corporation (Olin) for the Olin Chemical Superfund Site (Site) in Wilmington, Massachusetts. As specified in the Administrative Order of Consent (AOC) and the August 2009 RI Work Plan, the components of the Baseline Risk Assessment (BERA) will be submitted in a series of interim deliverables to allow for EPA comments at several stages in the risk assessment process. As requested by EPA, the "Third Interim Deliverable, Draft Final Baseline Ecological Risk Assessment, Operable Unit 1 and Operable Unit 2" was submitted on April 10, 2013. Comments below provide review of Draft Final Baseline Ecological Risk Assessment.

ECOLOGICAL RISK ASSESSMENT GENERAL (MAJOR ISSUE) COMMENTS:

1. The comparison site concentrations to medium-specific benchmarks in the BERA should be done on a sample-by-sample basis (Note: while helpful, this approach is not necessary for COPEC). The use of RME and CTE EPCs for benchmark comparison in the BERA may be useful for discussion purposes, but the only way to identify potential hot-spots and provide risk managers with sufficient information to make decisions is to provide sample-by-sample comparisons. This approach is even more essential when few lines-of-evidence are available for a specific assessment endpoint.

2. Acute AWQC and chronic AWQC should be presented together in the risk characterization. Because AWQC are promulgated standards, the exceedance of chronic AWQCs is instrumental in the risk management process.

3. Food chain modeling BAFs have major issues. There is insufficient information regarding the hierarchy of sources used to develop each type, insufficient information provided

within the document to reproduce calculations (i.e., equations not provided and many input values not provided), inconsistencies in values among tables, and given the available information, it appears as though the values from regression modeling that result in tissue concentrations are erroneously used as uptake factors that are applied to abiotic media concentrations to calculate tissue concentrations. These problems have a ripple effect through all of the food chain modeling, affecting the HQ in various directions/magnitude depending upon the tissue type and COPEC.

4. For chromium animal BAFs, a different approach was used from what as in the July 2013 draft. Essentially, Olin asserts that there is no appropriate soil invertebrate BAF for chromium and, using the regression model they say is invalid, select not a BAF, but a tissue concentration of 4 mg/kg to be used as the EPC for chromium and hexavalent chromium at all sites for all animal tissues. This approach is not acceptable and potentially substantially underestimates chromium risks.

5. Although an approach to deriving TRVs was presented, the execution does not always seem to follow the approach. For example, the approach states that Eco-SSL values would be used first. COPECs such as PAHs, and DDT and metabolites, and arsenic have Eco-SSLs, but the TRVs therein were not used. Another example is that for lead in birds, a MATC of 1.63 mg/kg-day was reported and the table shows no uncertainty factors to be applied, yet the NOAEL TRV is 4.7 mg/kg-day and the LOAEL TRV is 8.3 mg/kg-day. These problems affect the HQ in various directions/magnitude depending upon the animal class and COPEC.

6. Dose calculations using Olin's inputs are not reproducible for a large number of the ones that were checked (i.e., 19 out of the 36 "Total Dose" values). All 19 values that EPA calculated are higher than what Olin calculated. Six of these were different enough to result in risks greater than 1 for at least the NOAEL-based HQ that was lower than 1 based on Olin's calculations. For example, Table – EA-5 – RME – Red-Tailed Hawk – 2 shows bis(2-ethylhexyl)phthalate NOAEL-based and LOAEL-based Total HQs of 0.64 and 0.064, respectively. Using the values presented on Olin's tables, bis(2-ethylhexyl)phthalate NOAEL-based and LOAEL-based Total HQs of 1,690 and 169 were calculated. Please show the calculations as to how the Olin HQs were reached.

SECTION 2.0 SPECIFIC COMMENTS:

7. Section 2.3. Page 2-3. I responding to EPA's comments regarding the Evaluation of Ammonia in Surface Water, Olin provided some valuable detailed information of the derivation of the AWQC for ammonia (See Comment No.8, 21 March 2014 Response letter from Olin). It would be helpful if Olin would provide some of that detailed response in Section 2.3.

SECTION 3.0 SPECIFIC COMMENTS:

8. Sections 3.5.1 and 3.5.2. Page 3-6. Olin should include wildlife likely (based on habitat conditions) to occur for each exposure area in Table 3.5-1, not just those species observed during weir inspection. Unless field activities were focused on identifying potential ecological receptors, it is unlikely that numerous more secretive species were not observed. Therefore, a general list of potential receptors based on existing habitat conditions in typically provided so that reviewers can assess the appropriateness of the receptors selected.

9. Section 3.5.9. Page 3-8. Olin had agreed to provide additional information on the source(s) of water for the Off-Property West Ditch. This information was provided in the response to General Comment No.2 (See 21 March 2014 Response letter from Olin) and it would be helpful if this information was added to the text.

10. Section 3.12.2.Page 3-24. Please provide the criteria used to select which study result (i.e., LC50 value) was selected from the ECOSAR database to be used to develop the chemical-specific benchmark. Was the lowest LC50 value used or were other criteria employed? Was any consideration given to matching the ECOSAR organism with conditions with the water body? Why were NOAELs converted to LC50s when LC50s are already provided? (For example: why was the ChV value for fish selected over the daphnid ChV for bromodichloromethane, when the daphnid ChV would have resulted in a much lower benchmark.)

11. There is no discussion in Section 3.11.1 Data Used in BERA regarding chromium and hexavalent chromium. How were they handled? Both Chromium and Hexavalent Chromium appear in Tables 3.13.

12. All surface water in the South Ditch was used as a single dataset (per footnote in Table 3.11-1) to evaluate ecological risk from surface water in both the USD and LSD exposure areas. This should be mentioned in the text of section 3.11.1 (page 3-19).

SECTION 4.0 SPECIFIC COMMENTS

13. Section 4.2 Page 4-2 Effects Benchmarks. Comparing RME and CTE EPCs to medium-specific effects benchmarks is not the most effective way to assess risk. Medium-specific benchmarks should be compared to site concentrations on a sample-by-sample basis.

14. Section 4.2.1 Page 4-3 Surface Water Effects Benchmarks. Acute values are not appropriate to use as the only non-screening surface water benchmarks. Acute values may be used to describe site conditions, but they cannot be the only regulations evaluated. Federal criteria and generally state guidelines indicate both chronic and acute values must not be exceeded for particular time periods.

15. Section 4.2.2 Page 4-4 Method Used to Calculate HQs. As stated in Comment #1, EPC and CTE EPC are not an effect way to assess risk when comparing site-related concentrations to medium-specific benchmarks.

16. Section 4.2.2 Page 4-4 and 4-5 Method Used to Calculate HQs. It is of limited value to calculate incremental risk for MMB because the background dataset is so small. It would be more appropriate to discuss this in the uncertainty analysis.

17. Section 4.3 Page 4-5 Effects Benchmark Comparison Results. See previous comments on sample-by-sample comparisons and the use of EPC benchmark comparisons.

18. Section 4.7 Page 4-8 Uncertainty Analysis. The uncertainty analysis provided is very general with the exception of the discussion of the chromium bioaccumulation factor. EPA ecological risk assessment guidance recommends a discussion of uncertainty at the end of the risk characterization step so that specific uncertainties associated with the risk conclusions and interpretation can be provided. If possible this will include specific discussions of endpoints where risk may have been over- or underestimated.

19. Tables 4.3-1 through 4.3-15. It is not appropriate to compare plant or invertebrate benchmarks with EPCs. These receptors are sessile or relatively sessile and are not exposed to an average concentration. Sample by sample comparisons are more appropriate.

20. Missing C_{sw} for 4 analytes on Table 4.1-4: hydrazine, 4,4'-isopropylidenediphenol, 4-Nonylphenol (Tech.), and Kempore (Azodicarbonamide).

21. Missing C_{sed} for EPH, Total on Table 4.1-4.

22. Section 4 Tables - Summary of Food Chain Model and Hazard Quotients – Incremental risk was calculated for organics. This is inappropriate.

ATTACHMENT 5.0 SPECIFIC COMMENTS

23. General: Tables were added/deleted from the front of Attachment 5. Most of the table references in text were not updated.

24. Section 3, Page 3. Original Comment No. 48. Not addressed sufficiently. Some text was added, but there still is no hierarchy presented for the sources used to select literature-based BAFS and the bullet list meant to describe how BAFs were formulated, when not found in the literature, still includes sources for literature-based BAFs (e.g., Baes et al., 1984).

25. Section 3, Page 3. Original Comment No. 49. Not addressed sufficiently. Some text was added, but there is no acknowledgment that the chemical-specific log Kow below which bioaccumulation is not expected can differ per different habitats/organisms/datasets. In addition, there is an assertion that "chemicals with log Kow less than 3.0 are not bioaccumulative, even if USEPA included them in the Eco-SSL." This statement is based on an EPA document that was published seven years prior to the latest Eco-SSL guidance and is based on sediment. The added text does not answer the comment and implies that more recent EPA guidance has no merit or weight.

26. Section 3, Page 3. Original Comment No. 50. Dietary information available is dependent upon the receptor. Attachment 5-6 indicates that the red fox eats fruit, for which a Br would be more appropriate to estimate concentrations. Regardless, the response to comments indicated that uncertainty with using Bv values over Br values would be addressed in the text. The reviewer could not find this discussion in the text.

27. Section 3, Page 4. Original Comment No. 51. BSAFs by definition do not apply to inorganics (see Table 5-10, footnote #6). A BSAF expresses the steady-state difference between the concentration of a bioaccumulating neutral (nonpolar) organic chemical normalized on the organic carbon content of a sediment, and the concentration measured in the total extractable lipids of an organism… (see http://el.erdc.usace.army.mil/bsaf/what.html). The report needs justification that currently is only partially presented in Olin's response. If this approach is more conservative than using a water-based BCF for inorganics, then Olin should provide discussion to that effect.

28. Pages 4-6, discussion of chromium BAFs. This approach is not acceptable. Risk assessment states that "All three sources available (Sample et al., 1998a, b, USEPA, 1999) clearly demonstrate that chromium concentrations in aquatic invertebrate or terrestrial invertebrate (earthworm) tissue are nearly independent of corresponding concentrations in sediment and soil." This statement is a bit of a stretch. EPA 1999 does not mention anything regarding the reliability of the chromium BAF and suggests BAFs of 0.01 mg C/kg WW tissue per mg C/dw soil and 0.39 mg C/kg WW tissue per mg C/dw sediment. Sample et al. 1998a indicates that chromium uptake is dependent upon the speciation, with hexavalent being more available than trivalent, and that there is no good model (meaning regression model). Paper suggests the use of the 90th percentile uptake factor of 2.7 mg C/kg dw tissue per mg C/kg dw soil as a conservative estimate. Lastly, Sample et al., 1998b states that a model (meaning regression model) could not be validated for chromium and recommends the use of the 90th percentile uptake factor. Based on depurated organisms, this UF would be 0.186 mg C/kg dw tissue per mg C/kg dw sediment.

29. Figure, top of page 5. Regression lines are missing.

30. Figure, bottom of page 5. Axis not labeled.

31. Page 6 – Using 20 mg/kg as the chromium animal tissue concentration based on eye-balling a value from a scatter plot is not appropriate.

32. Page 6, 2nd sentence. This approach is not legitimate to use for invertebrates; therefore, it is not an acceptable surrogate for amphibians/fish either.

33. Section 3.3, Page 6. Original Comment No. 52. Response indicates that there is historical precedent in USEPA Region I for using mammal TRVs for birds when bird values were not available. The reviewer is not familiar with any instances of this. Please provide some examples.

34. Attachments 5-1 and 5-2. Original Comment No. 56. Now have wet weight/dry weight indicated for the IR values. However, the soil and sediment ingestion rates are noted as wet weight but should be in units of kg/day dw.

35. Attachment 5-1. Original Comment No. 57. The response to comments indicated that underestimation of tissue body burdens due to not accounting for soil intake by the prey would be discussed in the uncertainty analysis. The reviewer could not find this discussion in the text.

36. Attachment 5-1. Soil ingestion rate should be in units of kg DW/day, not kg WW/day.

37. Attachment 5-2. Sediment ingestion rate should be in units of kg DW/day, not kg WW/day.

38. Attachment 5-3. The EPA calculated soil ingestion rate for the American robin slightly is higher than what is presented (5.8E-04 versus 5.3E-04). May be due to rounding/significant figures used.

39. Attachments 5-3 through 5-6, footnote b. 85% moisture content used for vegetation different from what is used in Attachment 5-11, footnote b(2). The values should be

consistent unless a valid reason for the difference can be supplied. EPA believes the 85% value is more appropriate.

40. Attachments 5-3 through 5-10. Original Comment No. 64. This response does not address all of our comments to this issue. EPA's response to the 9 January Discussion Memo from Olin provided a detailed discussion of our concerns with Olin's proposed approach. The back-check of EPA's Comments on Olin's January 9, 2014 Additional Discussions for Comments #55 and #64 to the April 2014 BERA reveals that some of the comments were not addressed; specifically, comments regarding certain raccoon parameters and moisture contents for aquatic prey as follows:

    - Page 3-18 of the latest draft of the BERA indicates that assessment endpoint 10A includes the muskrat as an herbivorous mammal and 10B includes the raccoon as an omnivorous mammal. The dietary composition presented in Attachment 5-9 for the raccoon indicates the dietary composition as being comprised of 80% vegetation; which is the same as presented for the muskrat in Attachment 5-10. This does not seem to fulfill the intent of the endpoint – to evaluate a semiaquatic omnivorous receptor. Please change the dietary compositions to reflect the raccoon's omnivorous diet and update any subsequent calculations.

    - The invertebrate moisture content value from the Ecological Soil Screening Level Guidance (EPA, 2005) should not be used as the surrogate moisture content for fish and amphibians. Aquatic prey moisture content can be found in other sources, such as the *Wildlife Exposure Factors Handbook* (EPA, 1993).

41. Attachment 5-4. Original Comment No. 68. Disagree with the response; however, the comment is now not applicable as the Exposure Frequency parameter was eliminated from the food modeling algorithms.

42. Attachment 5-4. The EPA calculated soil ingestion rate for the Red-tailed hawk is slightly higher than what is presented (1.1E-03 versus 1.0E-03). May be due to rounding/significant figures used.

43. Attachments 5-7 through 5-10, footnote b. States that 84% moisture content was used for invertebrates based on dietary water content values from USEPA, 2005. This reference is guidance for Eco-SSLs. Aquatic invertebrate-specific values should be used (e.g., EPA 1999). In addition, this terrestrial invertebrate moisture content was used as a surrogate for fish and amphibian tissue. Fish moisture contents at a minimum are available from EPA, 1993 and should be used instead of terrestrial invertebrate values.

44. Attachment 5-7. Original Comment No. 73. Although I agree that it makes very little difference in the end: 1) it is still internally inconsistent and 2) how many times do you let them get away with, it doesn't really make any difference? It is all over the responses.

45. Attachment 5-7. Original Comment No. 74. The comment has nothing to do with whether or not EPA accepts Beyer et al. (1994) as a source (which it does). The marsh wren is not one of the species listed in Beyer et al. (1994) and no justification for using a surrogate or which surrogate species from Beyer et al. (1994) has been provided. Response insufficient.

46. Attachment 5-8. Original Comment No. 77. Olin did not respond to the omnivorous bird ingestion rate use. The source for the EPA recommendation is: http://www.epa.gov/osw/hazard/wastetypes/wasteid/hwirwste/pdf/risk/data/s0042.pdf.

47. Attachment 5-9. EPA calculated food and water ingestion rates are slightly lower than presented (0.47 kg/day ww vs 0.48 kg/day ww and 0.47 L/day vs 0.48 L/day, respectively). In addition, EPA calculated sediment ingestion rate is slightly higher than presented (0.0069 kg/day dw vs 0.0068 kg/day dw).

48. Attachment 5-11. Original Comment No. 84. It was requested that the references for the BAFs be provided, instead, the BAFs were deleted. It has been requested several times that the hierarchy of sources being used to develop BAFs be presented; and this has not been done. A BAF for thallium is available in EPA's 1999 Combustor Guidance; because no BAF is available for antimony, the Eco-SSL Guidance (EPA, 2007) suggests a default value of 1.

49. Attachment 5-11. Original Comment No. 86. Footnote D was not revised to contain additional information. The reviewer should not have to check multiple references to figure out from where the value was obtained. Footnote F had additional information added but still insufficient information to recreate values. Comment stands unaddressed.

50. Attachment 5-11. Original Comment No. 88. Olin did not incorporate the more recent guidance as requested by EPA.

51. Attachment 5-11. Original Comment No. 89. Value used (80%) does not match what is in the newly provided reference. First, USEPA 2005 has been updated and the 2007 document should be used. Second, the moisture content for foliage in USEPA 2007 is 85%. This value should not be modified to incorporate the moisture content in seeds as Olin, in response to Comment 50 asserts that there is insufficient information available to justify the use of Br (which includes seeds) over Bv (foliage) values for inorganic BAFs.

52. Attachment 5-11. Original Comment No. 91. Revision of the footnote does not clarify the methodology. The regression estimates from the cited document result in plant concentrations, not in BAFs and values resulting from the equations should not be on the BAF table. The equations/parameters that would be used to calculate the BAF should be presented somewhere. Reviewer should not have to go to the original document to find the equation. In addition, the reviewer could not duplicate what would be a chemical-concentration-specific BAF using the 10 µg/g DW soil concentration presented in the footnote.

53. Attachment 5-11. Original Comment No. 92. Changes made did not assist in calculating the terrestrial/aquatic invertebrate BAFs. This portion of the comment stands unaddressed. In addition, footnote E2 was not updated and is still in conflict with E1.

54. Attachment 5-11. Original Comment No. 93. Changes made did not assist in calculating the terrestrial/aquatic invertebrate BAFs. Comment stands unaddressed.

55. Attachment 5-11. Original Comment No. 96. Three “Sample et al 1998” documents were added to the reference list; however, this does not fully address the comment. Two of the documents (http://www.esd.ornl.gov/programs/ecorisk/documents/bjcor-112a1.pdf

and http://www.esd.ornl.gov/programs/ecorisk/documents/bjcor-133.pdf) are not noted as being authored by Sample et al.; nor does the ORNL website (http://www.esd.ornl.gov/programs/ecorisk/biological_uptake.html) note them as such, but as by Bechtel-Jacobs. Please correct the references.

56. Attachment 5-11. There are still major issues with the table that generally fall into two categories: 1) insufficient information given to recreate values and 2) sufficient information provided, but values not reproducible. Detailed notes are given below.

    a) The magnitude of the footnotes are almost as long as the table. It would be better to put so much and such detailed information in text so it can be more easily read and understood.

    b) Log Kows. Footnote indicates they were obtained from the SRS Interactive LogKow database. This information is insufficient to find the source. In addition, if the source provides both estimated and measured or multiple log Kows of either category, it must be detailed in the risk assessment the processes/rationale for selecting log Kows.

    c) If a BCF or model is not available with which to calculate concentrations in tissue, it is customary to use a default value (e.g., organics = 1.0, inorganics = geomean of available inorganic BCFs) so that the COPEC can be evaluated. Please use default BCFs when no BCF/model could be identified.

    d) Terrestrial Plants:

        1. Cannot recreate any of the BCFs that appear to be based on the regression equations.
        2. Beryllium appears to have the wrong footnote. I.e., should be 4 instead of 3.
        3. Footnote b(3).
            i. Sample et al, 1998a is cited and the references at the bottom of the table indicate the document is “Empirical Models for the Uptake of Inorganic Chemicals from Soil to Plants.” This document is a Bechtel-Jacobs

document, not Sample et al. Please correct the citation/author throughout the document.

ii. Says that “Preference was given to recommended regression estimates.” There are recommendations for “general” and “conservative” estimates. Which were used?

iii. Two different potential methods are covered by the footnote – regression and median uptake factors. There should be one footnote for each. The reviewer should not have to go to the original source to determine which method was used for a particular chemical.

iv. Indicates regression models were used. For transparency, the equations and inputs should be provided.

v. Says that the values shown are based on a concentration of 10 ug/g dw. Is the 10 ug/g dw supposed to be a soil EPC? Please clarify. In addition, the median values mentioned in the bullet are uptake factors directly from the source and are independent of that 10 ug/g dw. As for the regression equations, the results are concentrations in plants and not a bioaccumulation factor; therefore on two levels it is inappropriate and misleading to present a single value for chemical in this table.

e) Terrestrial Invertebrates:

1. Cannot recreate any of the BCFs that appear to be based on the Jager (1998) or on Sample et al. 1998 regression equations.
2. It appears as though a moisture content of 80% was used to convert from a dry weight to a wet weight BCF when the earlier tables (e.g., Attachment 5-3 through 5-10) indicate that a the moisture content of invertebrates is 84%.
3. See issues with chromium BCFs noted previously.
4. Footnote c(2):
    i. All equations and inputs used to develop BCFs from the Jager (1998) paper need to be presented.
    ii. It appears that the note stating that the “model was parameterized with bulk density (water, lipid) and fraction water values…” should read “bulk density (worm) and fraction lipid values.” However, one cannot be sure of that correction given the lack of transparency in how this paper was used.

iii. It is not understood why a soil organic carbon content was assumed to be 0%. Were there no site-specific TOC data available to be used? In addition, it is believed that the use of a 0% value would actually result in an equation that would be divided by 0, giving an error instead of a BCF.

iv. It also seems quite odd that all of the BCFs calculated based on an equation that uses the Kow as the variable would all result in BCFs of 1.0 and 1.1 for COPECs that have ranges of log Kows between 3.13 and 6.91.

v. Jager (1998) does not state that BSAFs are not estimated for analytes with LogKows <3. The conclusions of the paper say that “Equations 2 and 3 can be used to predict BCFs for earthworms in the log Kow range 0 to 8.”

5. Footnote c(3):

vi. Not all of the inorganics listed in Attachment 5-11 have regression equations in Sample et al., 1998b. Please provide the source/selection processes separate from the regression footnote.

vii. Akin to plants, says that the values shown are based on a concentration of 10 ug/g dw. Is the 10 ug/g dw supposed to be a soil EPC? As for the regression equations, the results are concentrations in earthworms and not a bioaccumulation factor; therefore on two levels it is inappropriate and misleading to present a single value for chemical in this table.

f) Small mammal/small bird:

1. Cannot recreate any of the BCFs for organics.
2. Footnote d(2):

i. The Travis and Arms (1988) paper does not mention QSARs so how is a “biotransfer factor QSAR model” from this source used?

ii. The Travis and Arms (1988) paper presents equations for biotransfer factors from soil to plants, soil to beef, and soil to milk. Please justify the use of what would appear to be beef biotransfer factors when references are available to calculate bioaccumulation to small mammals/birds.

3. Footnote d(3):

iii. Footnote indicates two possible sources, break into two different footnotes. Readers should not have to go to the original sources to determine which were used.

iv. Sample et al. (1998c) presents estimations for insectivores, herbivores, omnivores, and /or “all”. Please indicate which estimators are used and provide rationale for their selection. It would be most correct to tailor the feeding guild to the receptor evaluated in the risk assessment.

v. The biotransfer factors in Baes et al. (1984) are also beef biotransfer factors. Please justify their use for small mammals/birds.

g) Aquatic Plant column header footnote should be “b” instead of “d.” Comments on terrestrial plant BCFs apply.

h) Aquatic Invertebrate:

1. It is curious that for many inorganics, the aquatic invertebrate BCFs = the soil invertebrate BCFs when different sources with different data sets are indicated from the footnotes. Please indicate in the table if and when soil invertebrate values were used when aquatic invertebrate values were unavailable.
2. Footnote e(2): Same comments apply as for c(2) with the exception that it is Jager stated that BSAFs are not estimated for analyst with logKows <1. In addition, the <1 is inconsistent with the <3 presented in Footnote e(1).
3. Footnote e(3):
   i. Sample et al, 1998d is cited and the references at the bottom of the table indicate the document is “Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridge Reservation.” This document is a Bechtel-Jacobs document, not Sample et al. Please correct the citation/author throughout the document.
   ii. The document presents regression models and uptake factors. Which were used?
   iii. Uptake factors and regressions used in Sample et al. (1998d) are based on dry weight. Please provide the moisture content and source for what was used to convert to wet weight.

iv. Akin to plants and invertebrates, says that the values shown are based on a concentration of 10 ug/g dw. Is the 10 ug/g dw supposed to be a soil EPC? As for the regression equations, the results are concentrations in earthworms and not a bioaccumulation factor; therefore, on two levels it is inappropriate and misleading to present a single value for chemical in this table.

i) Fish/Amphibians:

1. Values for tetrachlorethene and bis(2)ethylhexylphthalate are default values of 1 and should be presented as such.
2. There appears to be a disconnect in the logic that default values of 1 can be used from a source for fish BSAFs when data are not available, yet when no fish BSAFs can be found for other chemicals from the list of sources, soil invertebrate values are used instead of the default of 1. It is also interesting to note that in 14 of the 16 instances where the soil invertebrate value is used, it is less than 1.0.
3. Footnote f(3). The USCOE BSAF database has been offline for a bit and the values from it could not be checked.
4. Footnote f(5). Could not locate this reference so the values from it could not be checked.
5. Footnote f(6). Indicates BSAFs calculated using equilibrium-partitioning assumptions and a water-fish QSAR prediction model from Travis and Arms (1988). Travis and Arms (1988) does not have anything to do with EqP, QSARs, or fish. Please provide the appropriate reference.
6. Footnote f(7): Indicates that aquatic invertebrate values used for inorganics. See comments for e(3).
7. Footnote f(8): Does not appear to have been used in the table. Delete if appropriate.

j) Footnote g: Disagree with this approach. See comments for “Pages 4-6, discussion of chromium BAFs.”

57. Attachments 5-12 and 5-13. Please alphabetize COPEC lists. Citations not in reference list. Please provide full references. In addition, methylmercury values should be used instead of total mercury/mercuric mercury values for aquatic food chain exposures.

58. Attachment 5-12 (note, did not check every value):

    a) Please explain why COPECs such as PAHs, and DDT and metabolites, and arsenic were evaluated using sources other than the EcoSSL document when EcoSSL values were supposedly given priority according to Subsection 3.3 of Attachment 5.

    b) It appears as though some LOAEL values were used as NOAEL values, with the NOAEL TRVs being based on LOAEL values and LOAEL TRVs being derived by multiplying by 10 (e.g., aluminum and manganese).

    c) The reported LOAEL for lead was 1.63 mg/kg-day, but in the cited source, this appears to be the NOAEL value, with a corresponding LOAEL of 3.26 mg/kg-day.

    d) Eco-SSL documents are noted as USEPA, 2013. Date not correct.

    e) Not sure how the TRVs for cadmium, chromium, copper, and selenium were derived. Cadmium has a reported LOAEL of 1.47 mg/kg-day, yet no UFs were applied and the NOAEL/LOAEL TRVs were 1.5 mg/kg-day and 5.5 mg/kg-day. Chromium has a reported LOAEL of 1.6 mg/kg-day, yet no UFs were applied and the NOAEL/LOAEL TRVs were 2.7 mg/kg-day and11 mg/kg-day. Copper has a reported LOAEL of 19.8 mg/kg-day, yet no UFs were applied and the NOAEL/LOAEL TRVs were 19 mg/kg-day and 37 mg/kg-day. Etc…

    f) Not sure where MACTs are coming from in Eco-SSL documents. MACTs do not seem to be presented in them.

    g) Vanadium is listed twice with different values. Delete one.

59. Did not check any individual values in Attachment 5-13 (Mammalian TRVs). However, did notice that the NOAEL TRV equaled the LOAEL TRV for chromium VI and beryllium.

This appears to be incorrect. In addition, the chromium VI NOAEL is about an order of magnitude higher than the total chromium value. This seems incorrect based on the data EPA has seen (i.e., mammalian chromium VI TRVs should be lower than total/trivalent chromium). Also, please explain how, if no LOAEL is presented for chromium from the source, the LOAEL TRV can be 17 times higher than the NOAEL TRV when all of the UFs presented in this report are 5 or 10.

60. Attachment 5-14. Original Comment No. 101. This comment does not appear to be addressed. This affects the SFF values used to calculate risks. Please determine which values are correct i.e., those in Section 3 or those in Attachment 5-14 (formerly Attachment 5-15) and update in the text/tables and roll through the risk assessment as necessary. None of the values match as noted below.

EA	Section 3 (acres)	Reviewer Calculated Hectare Equivalent	Attachment 5-14 (hectares)	Reviewer Calculated Acre Equivalent
EA-2	2.75	1.11	0.94	2.3
EA-4	6.6	2.7	6.6	16
EA-5	1	0.4	0.34	0.84

61. Attachment 5-14. Original Comment No. 102. This comment does not appear to be addressed. This affects the SFF values used to calculate risks; the values may change based upon the changes from Comment number 101. However as noted in the original comment, the calculations are not correct. To further clarify, for the robin 0.34÷0.48 does not equal 1; for the fox, 0.34÷699 does not equal 1 either.

62. Attachment 5-14. Original Comment No. 103. This comment does not appear to be addressed.

63. Attachment 5-14. Original Comment No. 104. This comment does not appear to be addressed.

64. Attachment 5-14. Original Comment No. 105. This comment does not appear to be addressed.

65. Attachment 5-14 – Summary of Receptors and Exposure Pathways Evaluated in Food Chain Models:

    a) All four aquatic receptors report that surface water in the On-PWD/WDW Exposure Area should be evaluated, indicated by a “Yes”. However, there were no surface water data collected as part of the BERA for this exposure area. Therefore the “Yes” should be changed to a “No” for the marsh wren, green heron, raccoon, and muskrat.

    b) Background exposure areas (terrestrial and MMB) missing from this table.

    c) The Red Fox Exposure Media of Invertebrates should be changed from a “No” to a “Yes” for EA-2, EA-4, and EA-5.

Dose/Risk Tables – Only checked EA-5 and Lower South Ditch, Comments for Table 1s.

66. Dose/risk tables. These tables have little semblance of order and no table numbers or consecutive page numbering. This makes it very difficult to find a particular table. All tables should be numbered and listed in a TOC. Csoil Antimony should be 3.6E-01 and not 3.4E-01. This needs to be corrected for the other receptors as well: red fox, red-tailed hawk, and short-tailed shrew.

67. Calculated Exposure Point Concentration tables. Please specify wet weight or dry weight in the tissue units.

68. EA-5 – RME Calculated Exposure Point Concentration Tables.

    a) N-nitrosodi-n-propylamine, Nitrogen, as Ammonia; C11-C22 Aromatics, C19-C36 Aliphatics, and C9-C18 Aliphatics do not appear on Table 5-11. Therefore, it is not known whether the blanks on this table occur because there were no BAFs or if the BAFs were never researched.

69. Table EA-5 – RME – Robin – 1, Calculated Exposure Point Concentrations:

b) BAF Plant for mercury is dashed although there is one on Table 5-11.

c) BAF Invertebrates for benzo(a)pyrene, bis(2-ethylhexyl)phthalate, diphenyl ether, fluoranthene, phenanthrene, pyrene, 4,4'-DDT, and antimony do not match what is on Table 5-11. (This comment does not imply that Table 5-11 is correct, just that there are internal inconsistencies in the document.)

d) Many of the inorganics were noted on Table 5-11 as using regression models for determining COPEC uptake. These models output tissue concentrations and not BAFs. All of the tissue concentrations noted on these tables appear to be calculated by multiplying the abiotic medium concentration by the "BAF." This is incorrect. See comments on Table 5-11 for additional detail. In addition, even if the calculation were correct, the results intuitively make no sense. For example, the Terrestrial Invertebrate regression model for arsenic is a positive regression, yet the value calculated for arsenic on Table 5-11 based on 10 mg/kg dw soil = 8.6E-02 and on this table, based on 27 mg/kg dw soil is 1.2E-02.

70. Table EA-5 – RME – Red-tailed Hawk – 1, Calculated Exposure Point Concentrations: Same issues as noted for Robin regarding BAF invertebrates and the calculations based on regression models.

71. Table EA-5 – RME – Short-tailed Shrew – 1, Calculated Exposure Point Concentrations:

a) Same issues as noted for the Robin above.

b) BAF Mammal for arsenic, cadmium, chromium, hexavalent chromium, copper, iron, lead, and zinc do not match what is on Table 5-11. (This comment does not imply that Table 5-11 is correct, just that there are internal inconsistencies in the document.)

c) Table EA-5 – RME – Red Fox – 1, Calculated Exposure Point Concentrations. Same issues as noted for the Robin and Shrew above.

72. Lower South Ditch – RME Calculated Exposure Point Concentration Tables.

d) Di-n-octylphthalate, n-nitrosodi-n-propylamine, nitrogen, as ammonia, C11-C22 Aromatics, C19-C36 Aliphatics, and C9-C18 Aliphatics do not appear on Table 5-11. Therefore, it is not known whether the blanks on this table occur because there were no BAFs or if the BAFs were never researched.

e) Sediment-based BAFs are presented for 4,4'-isopropylidenediphenol and 4-nonlphenol (tech.) but these chemicals are not sediment COPECs.

73. Table – Lower South Ditch – RME – Heron – 1, Calculated Exposure Point Concentrations:

a) Table 5-11 indicates that concentrations for hexavalent chromium BAFs for invertebrates would be 4; this table presents a BAF then a calculated concentration different from 4. (This comment does not imply that Table 5-11 is correct, just that there are internal inconsistencies in the document.)

b) BAF Invertebrate for 2,4,4-trimethyl-1-pentene, 2,4,4-trimethyl-2-pentene, bis(2-ethylhexyl)phthalate, diphenyl ethere, diphenylamine, chromium hexavalent, and manganese do not match what is on Table 5-11. (This comment does not imply that Table 5-11 is correct, just that there are internal inconsistencies in the document.)

c) BAF Amphibian and BAF Fish for manganese do not match what is on Table 5-11. (This comment does not imply that Table 5-11 is correct, just that there are internal inconsistencies in the document.)

d) Many of the inorganics were noted on Table 5-11 as using regression models for determining COPEC uptake. These models output tissue concentrations and not BAFs. All of the tissue concentrations noted on these tables appear to be calculated by multiplying the abiotic medium concentration by the "BAF." This is incorrect. See comments on Table 5-11 for additional detail.

74. Table – Lower South Ditch – RME – Marsh Wren – 1, Calculated Exposure Point Concentrations. Same issues as noted for Heron regarding BAF invertebrates and the calculations based on regression models.

75. Table – Lower South Ditch – RME – Muskrat – 1, Calculated Exposure Point Concentrations.

    a) Same issues as noted for Heron regarding chromium and the calculations based on regression models.

76. Table – Lower South Ditch – RME – Raccoon – 1, Calculated Exposure Point Concentrations.

    b) Table title incorrect. Noted as CTE but should be RME.
    c) Same issues as noted for Heron regarding chromium and the calculations based on regression models.

77. Pages 186 and 187 of the PDF are totally unreadable because the compression is too great.

EAST DITCH SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

78. Tables 4.1-2 through 4.3-1. Original Comment No. 119. The response to comment carried through the Zinc CCC from Table 4.1-2 to Table 4.3-1 incorrectly. The screening benchmark for zinc should be reported on Table 4.3-1 as “0.13 mg/L “instead of “0.013 mg/L.” This changes the “Retain for Further Evaluation?” to a “NO” and the Rationale to “BSL.” Need to update text as applicable.

79. ECOSAR Surface Water Screening Benchmark Calculations, Footnote [f]. Original Comment No. 134. The response to comment did not do as stated in footnote [f] on Attachment 4. Footnote should read “CHV – Chronic Toxicity Value = LC50 / 0.10” and not “CHV – Chronic Toxicity Value = LC50 * 0.10.”